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GALVANISM AND SINE CURRENT TECHNIQUE

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To Wm Gilman Smith

With appreciation of his many

helps in other years long ago

Fred H. Hanaford

Boston April 4 '32

GALVANISM AND SINE CURRENT TECHNIQUE

GALVANISM AND SINE CURRENT TECHNIQUE

AN ILLUSTRATED TREATISE ON THE METHOD OF APPLYING THE LOW VOLT ELECTRIC CURRENTS FOR THERAPEUTIC PURPOSES, BASED ON THE AUTHOR'S EXPERIENCE COVERING A PERIOD OF OVER FORTY YEARS

By FREDERICK H. MORSE, M.D.

Ex-President of the American Electro-Therapeutic Association; United States Delegate to the International Congress of Physio-Therapy at Rome 1907, and at Paris 1910. Author of "Low Volt Currents of Physiotherapy"; with Dr. G. Betton Massey, co-author of "Galvanic Currents and Low Voltage Wave Currents in Physical Therapy"; member of several existing physiotherapy organizations.

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To my many coworkers and cordial friends in the American Physical Therapy Association, this book is affectionately dedicated

FOREWORD

A LARGE majority of physicians using physical methods in the treatment of disease are still unaware of many of the therapeutic measures which their apparatus provides. Not only the novitiate, but those with years of experience, are thus handicapped. This unfortunate lack of information exists mainly because a complete and thorough explanation of its capabilities has not been presented to them from an authoritative source.

Thus, many a physician has allowed himself to be content in confining the use of his therapeutic appliances to one or two of the more widely known procedures, while forty others of equal value might be as successfully adopted without added outfit or expense.

For instance, only the Alternating Current may be used consistently for treating constipation and its attendant evils, or a smooth Galvanic Current for relief of pain, while a score of other procedures, each one capable of producing equally gratifying results, might be as easily brought into daily use.

Conditions which are promptly amenable to treatment by physical methods are many and varied. They are encountered daily by every physician, be he general practitioner or specialist. Notwithstanding this, due to incomplete knowledge of the physical apparatus already on hand, these same conditions continue to be subjected to medical or surgical procedures, while physical methods would easily prove themselves more efficient.

This book, therefore, is presented to the users of low volt physical apparatus in the earnest hope that its readers may gain a more complete conception of the wide usefulness which their apparatus provides.

The methods of treatment herein described and illustrated have been used for many years with gratifying success by the author in his daily practice. Nothing is based on theory. Physicians who adopt these methods may therefore proceed with reasonable assurance that their efforts along parallel lines should produce equally gratifying results. It should be borne in mind, however, that personal judgment must be exercised in each individual case the same as when prescribing drugs or surgical procedure.

However, it is hoped that this book will be a helpful guide to those who have valuable low voltage apparatus but are still timid about using it. That many such units, representing heavy investments, are but partially used is no illusion. The author's experience extends over forty years and in that time he has found ample proof of this statement.

Furthermore, the assertion that there are no more thoroughly dependable therapeutic agents than the Galvanic and Alternating Sine Wave Currents is amply borne out.

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INTRODUCTION

THE mere fact that an electric current can be measured and adjusted to produce a definite and dependable action is the fundamental basis of all electrical therapeutics. If an acid is needed to produce a certain reaction, an alkali would be useless or harmful and vice versa. Therefore, one should no more attempt to use the electric current on the human body without a definite idea of what it is expected to accomplish, than he should to administer a powerful drug without knowing its exact physiological action. Physical applications are often made empirically, and the resulting confusion has prompted a widespread demand for an illustrated technique on the subject.

Galvani, in 1794, discovered that the use of a current generated from a friction machine would cause a contraction of tissue as shown by his initial experiment on frogs' legs; hence the term "galvanism." Volta, in 1800, discovered that by taking one or more cells containing dissimilar metals — as, for instance, zinc and carbon in a fluid which has an oxidizing influence on the zinc — an actual current could be established. In recognition of this discovery, electrical pressure has since then been called "voltage." Professor Ampere, fully appreciating the work of Volta, in turn, discovered the heat element in the Constant or Galvanic Current as applied to volume; hence the term "amperes."

Michael Faraday, an English scientist, supported by influence and wealth, was able to more fully develop what his predecessors had established as fundamentals

in the realm of electrotherapy and he was in fact the first to bring order out of chaos. Through this fortunate coincidence, "faradism" was born. Following Faraday, we find a long list of scientists, each of whom has devised, improved, condensed, discarded and reconstructed apparatus. Methods have been revised and mechanical devices have been remodelled and improved until at last the entire procedure has been lifted to a greater degree of perfection.

These bits of history have no direct significance except to bring out the fact that the electric current, as more correctly constituted for therapeutic purposes, is the result of long and intensive scientific study and not the product of hasty mechanical commercialism. Our present-day types of therapeutic apparatus are the results of careful scientific development and are thoroughly reliable except, perhaps, for certain hastily conceived devices designed to generate only a modification of the original electric force.

Quite naturally, during the process of evolution, many ideas and devices were inaugurated to enhance the value of the then existing theories and methods, only to be used for the period and finally discarded because of insufficient therapeutic value. The use of the low volt currents, however, has been highly improved and has apparently come to stay. This is evidenced by the growing interest shown in the medical profession, also by the ever-increasing number of scientific papers which are presented before medical societies and in medical journals. It is further emphasized by many recent books, wherein low volt electrotherapy is stressed as being in a class by itself and having features of paramount value not obtainable from any other source.

Out of the chaos of controversy, commercial ambition and professional research surrounding low volt therapeutics, there have emerged certain standards of effi-

ciency, fully substantiated by electrophysics, which have unquestionably become as essential to one's armamentarium as high frequency, lights, and other physical methods, but they are not so clearly understood.

When a current of low voltage is used for therapeutic purposes, so small an amperage is necessary that it must be measured in milliamperes (one thousandth of an ampere). This applies only to Unidirectional Currents which can be definitely and safely used for application to the human body, while the same use of rapidly Alternating Currents of low voltage must be governed by the point of comfortable tolerance.

A wealth of information on the subject of physics is easily obtainable from recent books and from articles appearing in the various medical journals. Consequently, no special discussion of the physics of the Galvanic and low voltage wave currents will be attempted in this book. (See books by Waddington, Grover, Massey, Cottle, Hollander and others.)

In omitting this, however, it is assumed that the reader is sufficiently grounded in the fundamentals of these currents to readily perceive the principles which underlie the procedures described and illustrated. Otherwise, before attempting to treat even in strict accordance with the technique herein described, a little concentrated study of these fundamentals, as outlined by recognized authorities, is earnestly recommended.

This advice, if followed, will save much guesswork in everyday practice. The physician will come to clearly comprehend the whys and wherefores of each procedure and thereby feel a calm assurance that he is carrying out well-defined therapeutic principles.

CHAPTER I

PHYSICAL THERAPY

THERE is one great fundamental law which any and every form of therapeutics must accept and observe, if a full measure of success is to be attained. It is the fact that the forces of nature, without exception, operate under fixed conditions and with unerring certainty. This law of nature is the very foundation of physical therapy, the procedures of which are designed to coincide with these natural forces in so far as they govern the physics and chemistry of the human body.

However, it must be admitted that each individual is governed somewhat by varying structural and physiological conditions, as well as by the external influences of habit and environment. Also, it is commonly admitted that normal human economy depends on conditions which permit every compensatory or reparative effort and process to be fully utilized.

Physical treatment or, in other words, the application of supplementary physical forces, is inherently giving aid to those natural physical actions just described, by reinforcing deficiencies or retarding, if not preventing, overactivity. Consequently, in all therapeutic applications, one must invariably proceed as nearly as possible in conformity with the particular way in which nature endeavors to accomplish the result. Furthermore, when it is remembered that some of the simplest procedures are often productive of the most gratifying results, it must be admitted that any empirical applications, even of supplementary physical forces, can never be a guide to successful therapeutics.

By the fundamental laws of nature, humanity is constantly in the grasp of external forces which react normally on normal organisms. These are food, drink, heat, light, air, sound, electricity, etc. However, when, as often occurs, their reaction becomes abnormal, we, as physicians, have acquired a knowledge of how some of the factors, particularly food and drink, can be consistently regulated and at the same time we have at our command certain means for supplementing the others. While this book will endeavor to confine itself to low volt electric currents, and show how they can be measured, controlled and used in conformity with natural physical laws, it is tacitly admitted that many other physical procedures are likewise amenable to proper regulation and equally serviceable as therapeutic agents.

To sum this up briefly, the foregoing attempts to point out that natural physical elements can be used to supplement and correct weakened or aggravated physical reactions and thereby assist a return to normalcy. It also contends that these supplementing elements must be correctly measured and intelligently applied if their action is expected to closely conform to the normal processes they aim to assist.

Aside from conditions the result of traumatism, extrinsic poisons and contagious disease, the majority of abnormal bodily reactions are caused by disturbed nutrition and the autogenous toxins thereby dispersed among the tissues in various parts of the body. Therefore, such conditions as arthritis, rheumatism, sciatica, arterial hypertension, headaches, constipation and the like are merely symptoms of an underlying cause. These symptoms can be permanently relieved only when the disturbing element is determined and the source of toxins eliminated, so that restoration of normal function may be induced.

Local treatment, to aid elimination, tends to unload and deposit any deleterious material in the blood, following which the blood must in turn continue and complete the eliminatory processes through natural channels. Local treatment produces its measure of relief, but it is here that physical methods may easily be abused if one's enthusiasm to hasten recovery is not restrained. By too greatly disturbing an overloaded toxic area, unpleasant reactions are liable to occur, such as headache, nausea, elevation of temperature, or even a temporary arthritic condition. Therefore, it is of paramount importance to clearly understand the limitations of the therapeutic agent employed.

CHAPTER II

GALVANISM

THE terms, "Direct," "Constant," "Unidirectional" and "Galvanic," when applied to electric currents, are synonymous, but "Galvanic" is the term usually employed in therapeutics. This current has the advantage of polarity effects and the production of heat at the negative pole. Because of this action, it causes a transmission of ions with consequent molecular changes, making it possible to treat certain areas not amenable to diathermy, as those about the head, the mucous surfaces, and special nerve areas.

It is much easier for a beginner in physiotherapy to master the principle and technique of the high frequency currents and diathermy, than it is to master the essentials absolutely necessary for the successful use of galvanism.

However, there is no lack of literature on the subject, and with a little painstaking, concentrated study of the established laws of electrophysics, one can learn not only how to use the current to produce a lasting benefit, but at the same time how to avoid doing harm with it. It must always be kept in mind that any form of treatment, whether medicinal, electrical or physical, if it has sufficient power to cause a change in circulation or molecular structure of tissues, is capable of doing harm as well as good. Therefore, a knowledge of its limitations should be one guide to the various applications of galvanism.

The Galvanic or Constant Current is a current of one direction only and is employed in the arts for causing

chemical decomposition, by means of which molecules and atoms in liquids are mechanically displaced. Electricity in other forms produces these results, but not so readily nor in the same degree as galvanism.

That the human organism is largely made up of fluid or semifluid constituents is well known, and this applies to both healthy and diseased tissues. It is also a demonstrable fact that a Galvanic Current, with such tissues in its circuit, exerts chemical activities which in turn produce a decomposition or chemical rearrangement of the tissue elements, as well as mechanical movements of the molecules and atoms in one or the other direction, according to their polar affinities. These changes result from the action of the Galvanic Current in its passage through animal tissue, and we, therefore, derive from it processes termed "Electrolysis" and "Phoresis."

When a current of electricity passes through a conductor, the conductor becomes heated. The current causes the atoms to vibrate and when increased, the amplitude of vibration correspondingly increases and the temperature rises. When a certain degree of heat is reached, molecules can no longer remain in a state of cohesion and either fusion or dissipation takes place. This is really a mechanical process, due to the increased temperature. Consequently, the manner in which electricity produces deep-seated effects is not mysterious. It brings them about through being a convenient and definite method of supplying heat.

Heat thus generated is essential to effecting dissolution of indurated and thickened areas which prevent the restoration of function. By supplying the needed heat, galvanism becomes somewhat analogous to the Alternating Current which is the source of diathermy.

An electric current, passing through a compound,

decomposes it; if it be water, oxygen appears at the positive pole, and hydrogen at the negative pole. If chemical substances are dissolved in the water, as solutions of potassium or copper sulphate, they will be decomposed — one part appearing at the positive and one at the negative pole.

When a solid is dissolved in water and a Galvanic Current passes through, the solid is not only broken into its molecules, which are individually scattered in the liquid and behave like gaseous particles, but the molecules themselves lose, in a great measure, their chemical cohesion and are continually changing partners. These interchangeable partners are called "ions."

An electric current, passing through such a mass of dissolved molecules, not only decomposes them, but also polarizes and directs them. Thus the use of the constant current is a convenient way of directing chemical action in the tissues, and the amount of chemical decomposition is in proportion to the strength of the current and the degree or amount of heat generated.

If a Galvanic Current is passed through a section of the human body, every molecule in the circuit will be affected to some degree. Where the greatest density of the current occurs depends on the local condition, or, in other words, on the presence or absence of good conducting material. Fatty tissue is a poor conductor, yet nerves and blood vessels running through it are affected.

The Galvanic Current, therefore, because of its special physiological and chemical action and consequently its wide range of therapeutic indications, without question stands in a class by itself. It has certain peculiar characteristics ranging all the way from local polar effects to interpolar action and when its physics are clearly understood these are oftentimes of great importance. Equally so is its cataphoric action which is

shared by no other method, viz., the electrical diffusion of metallic salts and medicaments.

With the Galvanic Current, moreover, reactions which may be made to appear by making contacts with living tissue and observed by the eye, cannot apply to physiological and chemical actions deeper in the tissues. This may be correctly styled the interpolar region, and it has been clearly demonstrated that chemical decomposition and recombinations do take place therein.

The negative pole is a stimulant since it increases the irritability of tissues. It is congestive, as it produces an accumulation of liquids and salts. With mild currents it promotes nutrition; with strong currents it has denutritive effects. It produces an accumulation of hydrogen and the hydrates of sodium, potassium and ammonium. These form saponaceous matter and are caustic alkalies. The effect of one is local anemia, and the other local hyperemia, and this must be remembered if the current is to be intelligently utilized. The negative pole has no antiseptic action, nor does it act on the electrode. The therapeutic value of galvanism is often enhanced by employing a unidirectional surging current to correspond with the normal muscle action of the part under treatment.

After summing this up, the reader can hardly fail to be impressed with the fact that the Galvanic Current, by reason of its physical properties and physiological action, is of inestimable value. Also, that in relieving congestions, in stimulating the circulation, in improving defective nutrition of muscles and nerves, and in the absorption of exudates, the Galvanic Current should not be confounded with any other therapeutic method.

Figure 1 shows the course the Galvanic Current takes in going through tissue when electrodes are of the same size.

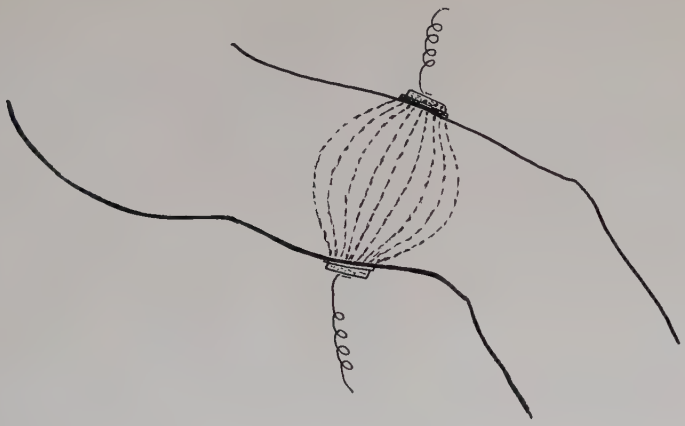

FIGURE 1

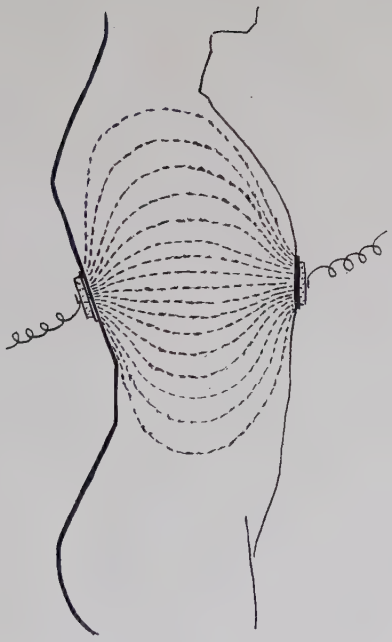

FIGURE 2

Figure 2 indicates the current passing through the body when it has been increased in volume over Figure 1.

Figure 3 shows the straight lines, instead of curved lines, that a diathermy current takes in passing through a portion of the body.

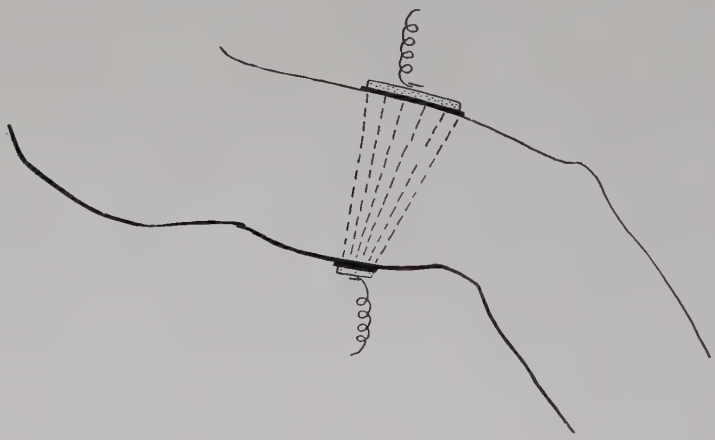

FIGURE 3

Figure 4 shows the course of the Galvanic Current when one electrode is placed on the side of the head, and the other at the occiput.

Figure 5 shows the direction of the current when two electrodes are placed on the same side of a limb. Figure 6 shows the still greater interpolar distribution as the current strength is increased.

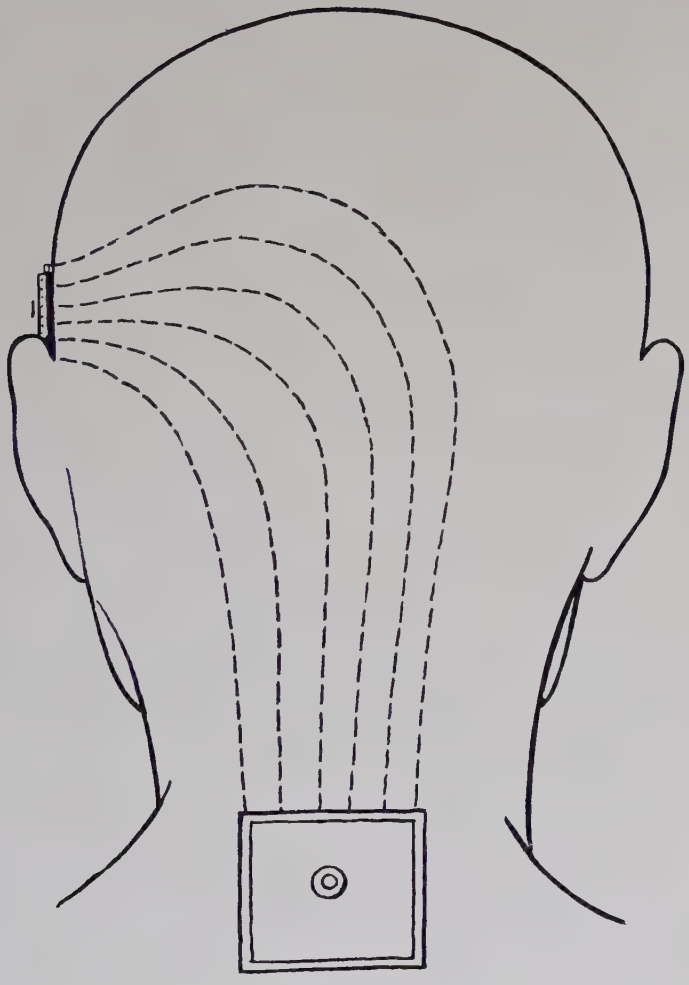

FIGURE 4

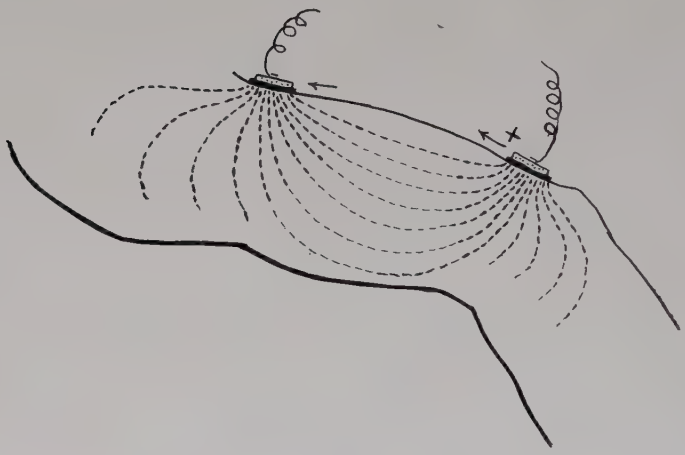

FIGURE 5

Figure 6 also represents two electrodes placed near each other on the surface and shows how there develops a dispersion of the current in proportion to its strength. The greater volume, of course, passes immediately from the edge of one to the approximal edge of the other, growing perceptibly weaker in the deeper tissues, but still affecting nutrition to a degree. This is not the usual way to make applications, but it has its indications; as, for instance, to promote healing of ulcers and treatment of skin affections where the ionic method is indicated.

Figure 7 shows how two electrodes of unequal surface cause a concentration of the current at the smaller one.

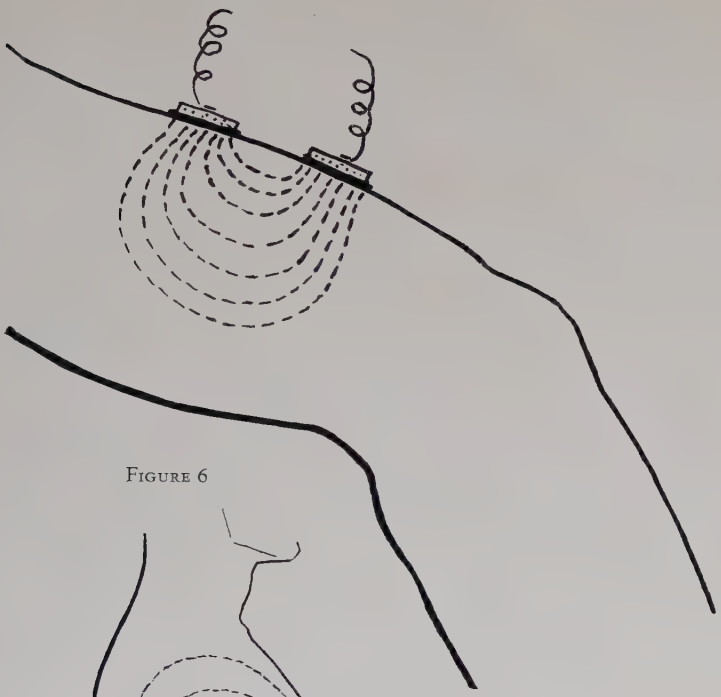

FIGURE 6

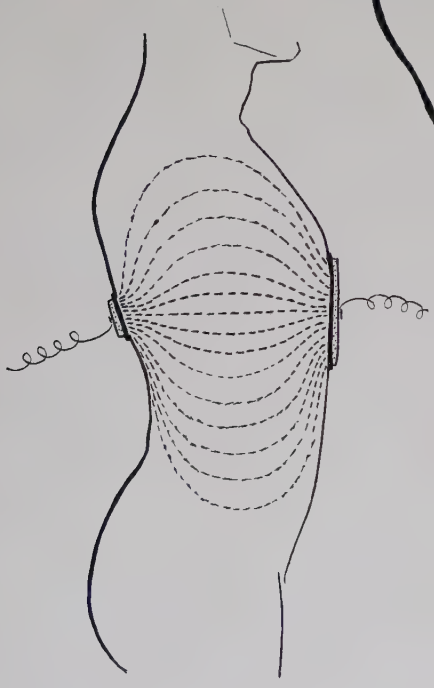

FIGURE 7

CHAPTER III

ELECTROMEDICAL NOMENCLATURE

THE varied nomenclature used by different writers to express the same meaning has been confusing to medical men, especially those to whom the subject is new. Consequently, a few words of explanation may not be amiss.

GALVANISM

For instance, the term "anode" means positive pole and the term "cathode" means negative pole. The term "Galvanic" is commonly used in medical practice, while "Direct Current" or "D. C." is the accepted name in the commercial world.

The commercial Alternating Current "A. C.," when used for galvanic purposes in therapeutics, has to be converted into "D. C." by means of a rectifier. No matter whether a current for medical purposes is transformed from a commercial "A. C." service, as just described, or taken from a direct "D. C." street current, a certain amount of resistance must be put in the circuit. This is done by means of a current controller, or "rheostat," which allows only the proper amount of milliamperage to be utilized.

It is very important for the user of galvanism to know the relative strength of voltage and amperage. Therefore, nearly all types of galvanic apparatus have both a voltmeter and a milliamperemeter in their circuit.

The conducting cords or wires are often spoken of as "rheophores" and these carry such various forms of connecting tips as would properly apply them to each make of apparatus.

WAVE CURRENTS

Despite the fact that much reliable instruction has been given by authoritative writers and teachers, there are still many physicians to whom the term "wave currents" is not entirely clear. They do not thoroughly understand either their nature or clinical indications.

A "Sine Wave" is a reversing Galvanic Current when used in a slowly surging manner. It then has more or less the same properties as the regular Galvanic Current, depending on the duration of the wave impulse. When this same current is employed, not in the form of a "sine" wave but as a "unidirectional" wave, there is no change in polarity and the positive and negative poles then maintain their polarity effect without interruption. Strictly speaking, a unidirectional wave having no polarity change is not a true "sine," and should be described as a Galvanic Wave Current. This brief explanation is offered in the hope of dispelling some confusion as to the true meaning and consequent therapeutic use of these modified forms of the original Galvanic Current.

When a current, very rapid in its polarity change, is combined with increased cycles by the apparatus producing it, it is correctly styled "Alternating Sinusoidal." This type of current, when the impulses are timed and measured to suit various physiological areas, really becomes a mechanical instead of an electrical form of therapeutics. Therefore, when any form of molecular gymnastics is required, as in intestinal stasis and various forms of paralysis, it is the proper current to use.

On the other hand, if heat production is desired, the galvanic unidirectional surge carries a mechanical action as well as the heat generated at the negative pole. With this distinction in mind, it should not be difficult to make an intelligent selection of the current to be used.

WAVE CURRENT STIMULATION

As the term "wave current stimulation" will be used frequently throughout this book, its basic characteristics and essentials deserve a few words of explanation.

If a current of electricity when quiescent produces a certain amount of invigoration, its value can be enhanced by amplification without necessarily using more current. This is brought about by creating a rhythmic motion not dissimilar to that of the waves on the beach.

Taking water as an example, it can readily be seen that when quiescent any given amount will exert no greater pressure than is commensurate with its weight and volume. This same amount of water, however, if in rhythmic motion in the form of waves, will be found to exert greater pressure as well as produce force, and a noticeable impact when striking any object.

Likewise when receding the waves exhibit the ability to set in reverse motion any movable object which they have touched. Yet neither the weight nor volume of water has been increased or decreased.

From this it can be seen that any given amount of a current which can be adapted to agreeable therapeutic use can be amplified without being increased if it is put into rhythmical motion. In this way its beneficial effects are often materially increased, and nowhere can they be put to greater usefulness than in treating the deep-seated, half-paralyzed sections where there is an existing colon toxemia or gastroptosis.

CATAPHORESIS AND ELECTROLYSIS

Cataphoresis, metallic electrolysis and electrolysis proper should not be confounded.

Cataphoresis is a process whereby drugs are mechanically driven into the tissues by the Galvanic Current. Some drugs are electropositive, others electronegative, and therefore are attracted to that particular pole. For instance — zinc, aconite, copper and many others are electronegative and are driven into the tissues at the positive pole, while iodine, the salicylates, etc., are electropositive and are driven into the tissues at the negative pole.

Metallic electrolysis is the oxidation by the positive pole of such soluble metals as copper, zinc, iron and silver on mucous surfaces. These are not, as in cataphoresis, driven into the tissues, but are deposited on the surface, as an oxychloride, for instance, of zinc or copper. This has, for its beneficial effect, only the local action of the drug used. None of these actions are like that of the actual cautery, which is a destructive process, which has burning effects alone.

Electrolysis is the chemical decomposition of tissue at the negative pole of the Galvanic Current.

FIGURE 8
Cataphoric Electrode

Figure 8 illustrates a cataphoric electrode made with a carbon base surrounded by a rubber rim. Drugs to be used are placed on the end, usually in a solution with absorbent cotton. The carbon is used to avoid the undesirable action which metals other than gold or platinum might set up in conflict with that being employed for medication.

Figure 9 is an example of a copper-tipped electrode, used for metallic electrolysis.

The process we call "electrolysis" causes the absorption of proliferated cell elements, as it is purely a chemical action, based on well-known principles of electrophysics. Its action is similar in all cases. Structures which are of the formation just described are especially amenable to this method, and gratifying results are obtained equally well in the urethra, cervix, cavities about the head, and the esophagus.

FIGURE 9
Copper-Tipped Electrode

Fibrous tissue, the result of an inflammatory process, as occurs in the form of bands, hard, contracting masses, etc., which are usually confined to joint structures, is often amenable to relief from the solvent action of the negative pole of the Galvanic Current. When similar pathological processes take place in cavities and canals — and this applies to various parts of the body — plastic bands may form, narrowing the caliber and forming new tissue elements. Relief by surgical means is likely to be followed not only by the return of the original trouble, but exacerbation of the pathological process.

RESISTANCE

In order that the term *resistance* may be more clearly understood, it can be described as representing the easy and tolerant manner with which a current of electricity can be passed through the tissues or applied at any given point for therapeutic purposes.

It is well known that blondes are most susceptible to influences on the skin, all the way from ultra-violet light to friction and hand-massage treatments, and this applies equally to electrical applications. Therefore, in administering treatment, this fact must be recognized and the operator should use judgment and diplomacy in order to obtain the best results.

Fat, muscle sheath, tendons, cartilages and bone are lacking in ions but are by no means so lacking as to present a barrier to the passages of the electric current. Leduc has shown that the colloidal solutions of the body offer a very slight resistance, but that the membranes which envelop them offer a variable resistance to the movement of the ions. The denser the membrane the greater the resistance it will offer, and we can, therefore, readily understand that the surface of the body will offer greater resistance in certain parts than in others.

It will also be noticed, in treating chronically infected areas or fibrous tissue formation following injury, infections, or conditions such as arthritis, that more current will be tolerated than when that particular part of the body is in an entirely healthy state. This is due to the fact that impaired areas of this character have a loss of sensory as well as motor function, and it is a criterion to go by. If the case progresses favorably, it will be noticed, after repeated physical applications, that less and less current will be required to produce the same physiological effect, viz.: sensation and muscular response.

CHAPTER IV

APPARATUS AND ACCESSORIES—CARE AND GENERAL TECHNIQUE

IF a practitioner, either in medicine or surgery, should be indifferent in his antiseptic precautions or in regulating the dosage of powerful drugs, he would naturally expect calamity to follow. This is equally true if the application of physical methods is made without similar caution.

While this book is devoted wholly to the application of low volt electric currents wherein serious danger from careless handling is not an element, the fact that careful precaution is very essential should not be lost sight of. With this in mind, we come to the first very important consideration, viz.: the apparatus.

No attempt will be made to explain the care of the current-producing apparatus, itself, as those units are of varied types and different makes. Each requires care in line with its individual mechanical construction and the directions supplied by the manufacturer should be observed.

CARE OF ACCESSORIES

There are some essentials to the proper functioning of any electrical therapeutic apparatus and its requisite accessories upon which the success of its application depends, and they should be carefully watched. The two most important are *contact* and *resistance*.

To clearly understand resistance in the different parts of the body when associated with diseased conditions is

essential to every application and this will be explained in that connection. Resistance in general, as it applies to administering the necessary current, however, is of equally vital importance and it is emphasized here that it may not be overlooked.

Starting with the apparatus itself and assuming that the proper current has been generated, if this current is to be effective, the wires must carry it without interruption to the terminals or electrodes. To do this successfully, the wires must for one thing be devoid of oxidized metal contacts. An imperfect contact may not only thwart the desired result but might cause the patient to receive a series of unpleasant shocks. Therefore, it must be remembered that once the current has left the generating apparatus, there should be no interference or interruption anywhere in its path.

Diminished contact frequently results when the positive pole of the Galvanic Current has been used too many times through the same wire. Electrical oxidation also may develop within the rubber covering, allowing only a few of the several strands of wire to function. Either of these conditions results in increased resistance and poor conductivity.

Good contact at the terminal on the moist surface electrode is also very essential and this connection should be carefully watched at the metal attachment which may become loosened or oxidized. Imperfect contact at this point will cause resistance and retard the flow of the current as effectively as wires or cords which are not in good condition. These outer contacts should be kept in perfect order, also the metal portion within the electrode which, if neglected, may get into the same condition of nonconductivity.

There is one other condition (frequently overlooked) which seldom fails to impair the proper functioning of

the moist electrode and cause the patient unnecessary and unpleasant shocks. This is apt to develop in the filling or conducting material itself, whether it be asbestos or some other substance. The electrode filling is continuously carrying moisture and is often used for months and sometimes years. Under these conditions, it naturally accumulates a mineral content from the water itself, especially when the practice of using a saline solution is indulged in. Any excess of mineral commonly results in increased resistance and its attendant evils.

To maintain a normal conductivity in the electrode, the "filling" should be replaced from time to time by new material or the old material thoroughly washed in rain or distilled water. When carefully cleansed in this way, old electrodes will usually function as well as new ones. Many operators have condemned the manufacturer, the apparatus, or both because of trouble, only to find that proper care of electrodes was all that was needed to solve the problem. Equal care should be exercised in keeping all metal electrodes, metal connections and applicator tips firmly secured to their insulated handles.

SURFACE ELECTRODES

In the surface electrodes designed by the author, the filling necessary to contain the moisture is asbestos in a linen cover. The rubber back is separate and so all metal connections are exposed and can easily be repaired. Incidentally this type of construction allows a good opportunity for sterilizing the "pad" part.

CHAPTER V

ELECTRODES— GENERAL TECHNIQUE

THE proper placing of electrodes, whether of the moist type or those providing direct metal contact, is of greater importance than is commonly considered. First of all, whether the treatment is for the relief of pain or for active stimulation of degenerated muscular fibre, *electrodes should not be moved* while the current is passing between them. There can be no exception to this rule if real physical or chemical effects are to be produced.

To be sure, when a procedure is used for its psychological effect, as for instance, when stroking a muscle with a mild Faradic, a rapid Alternating or Sinusoidal Current, moving the electrode may be excusable. However, it is not the purpose of this book to enlarge on procedures of this character but rather to discuss actual physical effects productive of lasting results. One very important reason for not moving the electrodes (especially surface electrodes) when the current is on is that they would frequently pass over motor points (nerve exits). When that occurs, unpleasant contractions are bound to follow, especially if the current is strong enough to have any effect whatever. One has but to study the physiological effect of the low volt current to understand why this point is emphasized. And it is strongly emphasized, because many of the older writers and, unfortunately, some present-day instructors, wrongly advocate the opposite.

That a moist surface electrode should be thoroughly saturated is, or should be, understood by every one. Also, when it is placed on the surface of the body, the electrode should conform to the contour of the part in contact so that its entire surface will dispense the current evenly. Extra care must be observed when placing electrodes about the joints, over irregular surfaces, on hairy portions of the body, on the palms of the hands, and on the soles of the feet.

When a current is to be applied through the hand, the electrode should not be placed on the palm alone. To perfect the contact, a flat piece of sponge or chamois thoroughly saturated with water should be wrapped around the back of the hand and fingers and in and about the electrode. The sponge or chamois then becomes an actual part of the contact surface and carries the current to the back of the hand as well. This diminishes resistance and irritability and allows much more current to be used than could be if the palm was the only point of contact. The same rule applies equally well when placing electrodes on the feet, as is shown by Figure 41.

Small surface electrodes for the face, neck, feet or hands can best be held in place by elastic bands or bandages. At times, a small towel tightly pinned about the part will serve the purpose, but in any case care must be taken to insure perfect and complete contact. Unless the electrode is to be held in the ear or nose, on the eye, or on some part where it cannot be kept in place by these methods, it is unwise to allow the patient to maintain the contact by his own effort. As a rule, patients seldom realize the necessity of keeping the electrode still and if they are made uncomfortable or receive a shock from moving it about, the operator naturally gets the blame. Various sizes of sandbags and cushions are very requisite and a supply should always be within easy reach. Pil-

lows help to maintain a firmer and better contact in the hollow of the back, under the knees and elsewhere, when similar conditions exist. Double sandbags are preferable for the abdomen and chest.

It is a too common practice of operators, in preparing moist surface electrodes, to not only ruin their smooth appearance, which is so necessary, but impair their function by thoughtless manipulation. For instance, whether the soft filling of the electrode is made of asbestos, layers of absorbent cotton, flannel, spongiopiline, or other compounds, when being prepared for application, if it is twisted or in any manner changed temporarily in its shape for the purpose of diminishing the excess of water, it will sooner or later cause it to become lumpy and, consequently, a poor conductor. If the electrode does not have an even conducting surface, skin irritation is certain to follow; and the desired amount of current cannot be obtained. After an electrode is once spoiled in this manner it is not easy to restore. A safe and effective way to remove excess moisture is to place the electrode flat on its back and use a firm, even pressure with a small Turkish towel. By following this plan the liability of damage above described can easily be avoided.

In the common, everyday therapeutic applications, it is wholly unnecessary to cause painful shocks or even an unpleasant burning sensation. When that occurs, it is usually due to improper adjustment of electrodes or a wrong selection as regards size. To obtain the best results, when both external and internal electrodes are being used, the patient should recline on a couch. This insures as much relaxation as possible. A comfortable couch is always preferable to the ordinary hard examination table, and far better results will be obtained when the patient reclines than when compelled to sit upright

in a chair, or in any position which is liable to cause the least muscle tension.

In many instances, such as applying an electrode to the cervix, to cavities in the head, or even to the surface of the body for treatment of pain with galvanism, any considerable movement on the part of the patient may not only cause discomfort, but actually thwart the desired effect. Thus, the use of any substitute for a comfortable couch (unfortunately, a too common practice) is in reality very poor technique and should be consistently avoided.

The frequency and duration of applications, as well as the size and shape of electrodes to be used, depend mainly upon conditions surrounding each individual case. To correctly determine these points requires tact

FIGURE 10
Heater for Moist Electrodes

and judgment. In the following pages, therefore, any advice as to placing of electrodes, also any and all suggestions for strength of current and frequency of applications are given with that thought in mind.

Surface (moist) electrodes are necessarily made of various shapes and sizes to conform to anatomical areas and to increase or diminish resistance, as may be indicated. Electrodes from ½ by 1 inch, for diagnostic purposes, to 8 by 10 inches for gynecological applications are used. The size of electrode for the neck and shoulder 1½ by 8 inches, and for the spine 2 by 10 inches treating surface. For applications about the face, the electrodes should be 2 by 3 inches, and those used about the feet 2 inches square.

There are also irregular shapes to conform to various parts, such as 4 by 5 inches and 5 by 8 inches. Electrodes in these sizes are best adapted for treating intestinal stasis, as illustrations show.

HEATER FOR MOIST ELECTRODES

Figure 10 represents a type of heater which produces and maintains both heat and moisture at any desired degree. The use of such a heater saves time and obviates the annoyance of having to stop and moisten the necessary electrodes before application. This also lessens the possibility of deficient saturation which, in turn, reduces the conductivity of the electrode.

This heater consists of a square outside frame of sheet copper substantially reinforced by the same metal at the corners. It contains six shelves (12 by 14) made of perforated copper, which easily slide on side supports. In the base there is an electric stove (easily obtainable in the market), so regulated that the proper degree of heat may be maintained. Immediately under the lower shelf is a water-tight tank about an inch in depth, holding

one to three pints of water, as seems necessary. To obtain the close contact desired, a wooden or metallic frame is used to support the heater and built of sufficient height to have the stove make contact as described.

In an office or institution where electrodes may be in use for several hours at a time, the electrodes should be thoroughly saturated and the maximum heat turned on. The steam thus developed circulates through the perforated copper shelves until the electrodes have reached the proper point of heat and saturation. The stove then may be turned to "medium" or "low" and by remaining at either point the electrodes will be kept at the proper temperature for application. Thus, the unpleasant cold electrode contact can be avoided without special effort or annoyance.

The heater here illustrated has been used by the author in his office practice for twenty-five years. With this cut and description in hand, any metal worker could readily make one.

ELECTRODE SUPPORTERS

Figure 11 shows one of several types of supporter for rectal and vaginal applications, and is designed to keep the electrode in perfect contact. As glass or nonvacuum rectal and vaginal electrodes are often used in high frequency applications, it is very essential that any supporter must be free from metallic parts. Therefore, wood, fibre, or rubber should be used.

The rectal electrode supporter here illustrated measures about ten inches long and eight inches high, and has three holes extending through the back. It also has an aperture cut in the top to allow the metal connection of the wire to be sufficiently covered so that the patient cannot, by any means, receive a spark or burn from it, as

it is essential to press the supporter close to the patient's body. The under side of the supporter should be covered with a piece of corrugated rubber or have some rubber buttons to prevent slipping. Supporters of this type can be easily made from a cobbler's last by attaching a top portion and securing it by wooden dowel pins.

Therefore, it can be readily seen that a really valuable acquisition to one's working paraphernalia is often simple and inexpensive. In the author's opinion, such a supporter is indispensable if cervical or uterine applications are to be successfully made; also those for rectal ulcers or hemorrhoids, where it is highly essential that the electrode should not be moved during the application.

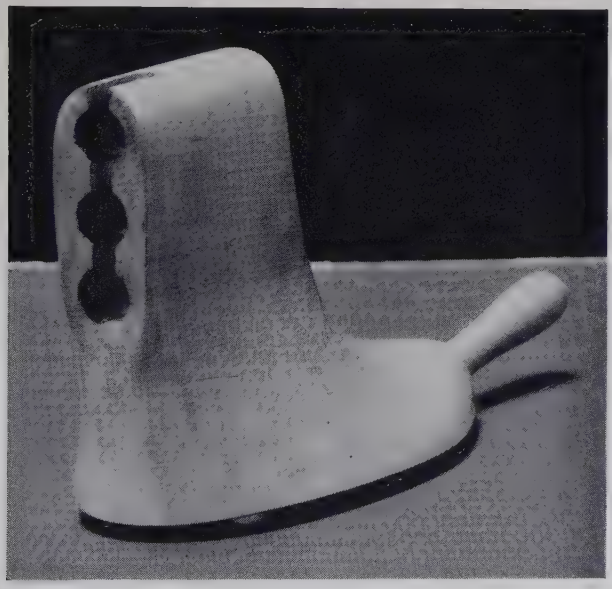

FIGURE 11
Electrode Supporter

CHAPTER VI

ELECTRODIAGNOSIS

WHENEVER a portion of the body has become functionally impaired through disease or injury, and galvanism or Sine Currents are indicated, a certain definite procedure should be outlined before an intelligent attempt to restore normal function by physical measures can be made. Electrodiagnosis, when carefully made, comparing the impaired part (arm or leg) with the healthy part on the opposite side, provides not only a definite guide for electrical application but for prognosis as well. During a series of treatments this can be periodically referred to and progress toward recovery definitely calculated.

Muscle response has commonly been determined by using both the faradic induction coil and the Galvanic Current. In recent years, however, the rapidly Alternating Sinusoidal Current, which, because of the rapidity of the sine, is devoid of any real galvanic action, frequently takes the place of the faradic. Paralyzed and semi-paralyzed nerves will often respond to a Galvanic Current interruption if sufficient current is used, but will contract only feebly or not at all to a Faradic or Alternating Sinusoidal. This is probably explained by the fact that the Galvanic Current, because of the heat element it contains, penetrates deeper and produces a temporary increase of local nutrition, especially at the negative pole because of the increased hyperemia caused at that point.

Figures 12 and 13 illustrate the usual electrodes used in the technique for electrodiagnosis. This as has just been explained is best accomplished by the use of the Galvanic Current, as it produces deeper and stronger contractions than either the Alternating Sinusoidal or Faradic Currents. The last two mentioned, however, may be used to verify the findings by the Galvanic Current and to ascertain if less current would produce any contractions of the muscle under scrutiny. If they do, it might be a means of determining how much vitality was actually left in the nerve supply to the part.

FIGURE 12

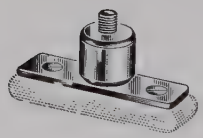

FIGURE 13
Electrodes for Electrodiagnosis

In general, when a defective nerve or muscle area in an arm or leg is under investigation, the positive electrode should be placed on the spine over the nerve exit leading to that particular area. This rule applies in the case of infantile paralysis, locomotor ataxia, also in the reaction of degeneration following traumatism, involving the whole of the arm or leg. There are, likewise, many other indications which are obvious.

When a galvanic apparatus is so constructed as to produce unidirectional galvanic waves, a rate of wave length can be selected to apply to the physiological action of the part under examination. When attempting in this way to determine the reaction of a muscle, the small diagnostic electrode should be placed on the part firmly, allowing the surging effect of the apparatus to produce the contractions instead of putting the electrode on and off or using the interrupter on the handle, shown in the foregoing illustration.

When making an application of galvanism or Sine Currents, through the abdomen direct, or via vaginal or rectal routes, it sometimes happens that severe pain suddenly develops within the circuit. After ascertaining that there is no faulty contact of electrodes, investigation should be made to determine if fixed adhesions surrounded by inflammation, a purulent salpingitis, cystic ovary, or some possible malignancy exists. Under such circumstances, cease physical treatment, immediately, as surgical areas are being encroached upon.

In making electrodiagnosis over debilitated nerve areas, certain motor points (nerve exits) will be found where response is elicited better than in other areas along the nerve under examination. This also applies to applications of the electric current for therapeutic purposes, and is a positive indication of just where the electrodes must be placed. The following are prominent nerves, and if studied in conjunction with the large muscle chart and the figures illustrating the nerve supply, it should be a great aid in diagnosis and treatment. (See pages 54 to 61.)

These are tabulated from the original teachings of Erb, who was the first to definitely outline and classify the anatomical areas for the purpose of more accurate diagnosis and definite therapeutics.

Arm and Forearm

1. The median, along the inner border of the biceps and at the bend of the elbow.
2. The musculospiral, at the point where it emerges from the triceps; namely, on the outer edge of the upper arm, about the junction of its middle and lower thirds.
3. The long thoracic (serratus magnus), on the inner wall of the axilla.
4. The ulnar, in the groove between the internal condyle and the olecranon.
5. The musculocutaneous, between the biceps and coracobrachialis.

Thigh and Leg

6. The sciatic, in the pelvic coats of the rectum, or just below the gluteal fold at the back of the thigh.
7. The anterior crural, in the fold of the groin just outside the femoral artery.
8. The peroneal, or external popliteal, just above the head of the fibula, beside the biceps tendon.
9. The internal popliteal nerve, in the popliteal space, and to the inner side of the tendon Achilles.

Cervical Region

10. The facial; its chief ramifications can be reached where they emerge from the parotid gland, choosing, for stimulation, three main branches of the facial.
11. The spinal accessory, at the top of the supraclavicular triangle.
12. The hypoglossal, along the upper border of the great cornu of the hyoid bone.

13. The recurrent laryngeal, along the outer border of the trachea.
14. The phrenic, on the outer edge of the lower part of the sternomastoid.
15. The pneumogastric and glossopharyngeal, along the track of the carotid artery just below the angle of the jaw.

Special Nerve Exits

4th Cervical — Deltoid, biceps; brachialis anticus, supinator longus; extensors of the hand.

5th Cervical — Deltoid (clavicular portion) biceps, brachialis anticus, serratus magnus, supinator longus; extensors of the hand.

6th Cervical — Latissimus dorsi, pectoralis major, serratus magnus, pronators, triceps.

7th Cervical — Teres minor, latissimus dorsi, subscapularis, pectoralis minor, flexors of the hand, triceps.

8th Cervical — Flexors of the wrist and fingers, muscles of the hand, extensors of the wrist and fingers, triceps.

1st Dorsal — Muscles of the hand; interossei.

3rd Lumbar — Iliopsoas, sartorius, adductors, extensor cruris.

4th Lumbar — Extensor femoris and cruris, peroneus longus, adductors.

5th Lumbar — Flexors and extensors of the toes, tibial, sural, and peroneal muscles, extensors and rotators of the thigh.

1st Sacral — Calf, long flexor of the great toe, intrinsic muscles of the foot.

Figure 15 illustrates the more prominent external muscles, and when studied in conjunction with Figure 14 of the nervous system, it becomes a very simple and satisfactory method of explaining to one's patients (and, incidentally, refreshing one's own anatomical knowledge) the relationship of the nerve supply to the damaged area and consequent pain resulting therefrom. It should be a guide, not only along with the motor point knowledge in electrodiagnosis, but for placing electrodes on the parts for treatment as needed.

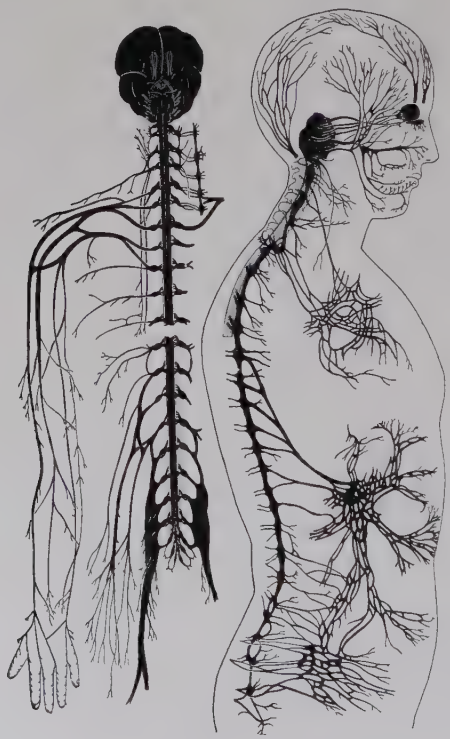

Figure 14

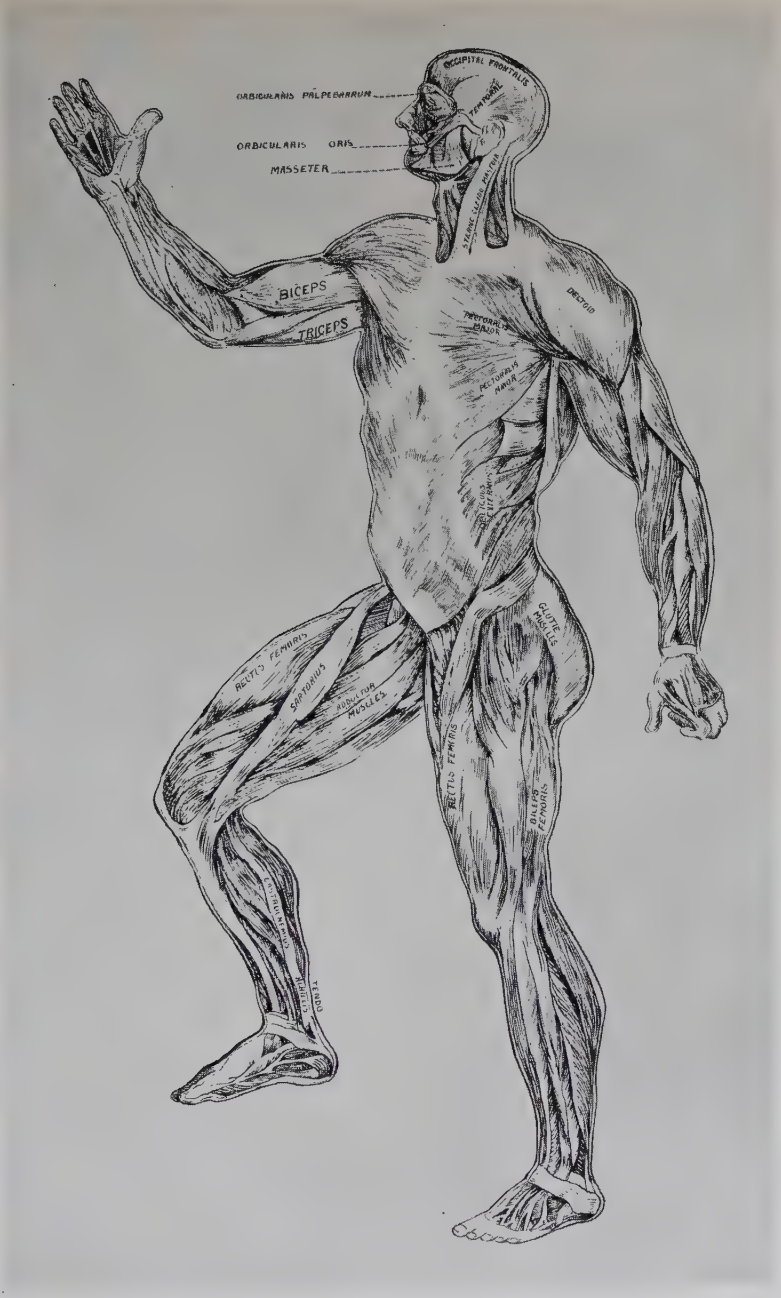
ORBICULARIS PALPEBRARUM
ORBICULARIS ORIS
MASSETER
OCCIPITAL FRONTALIS
TEMPORAL
BICEPS
TRICEPS
DELTOID
PECTORALIS MAJOR
RECTUS FEMORIS
SARTORIUS
ADDUCTOR MUSCLES
GLUTEUS MAXIMUS
BICEPS FEMORIS
TENDO ACHILLIS

Figure 15

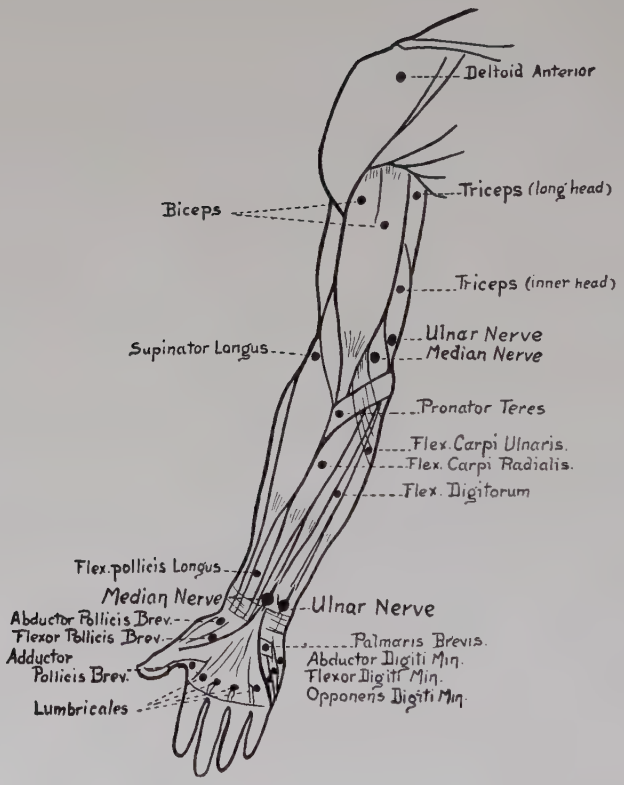

FIGURE 16

Motor Points on Anterior Portion of Arm and Forearm

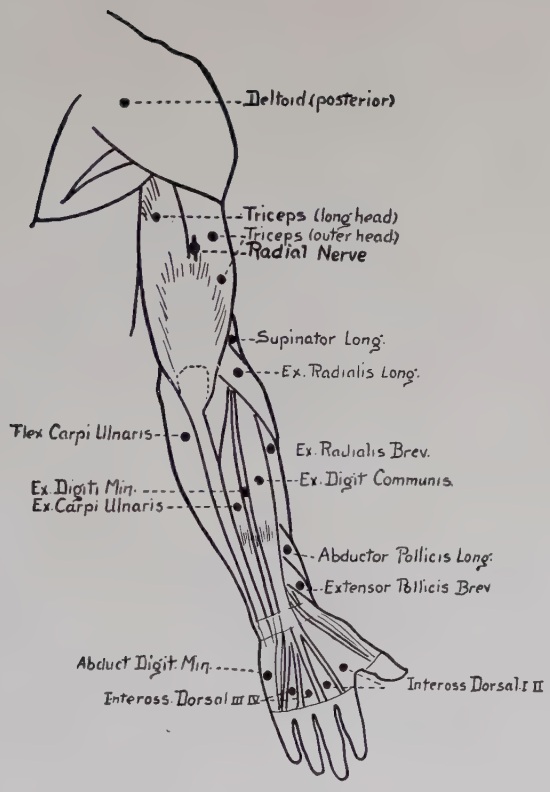

FIGURE 17

Motor Points on Posterior Portion of Arm and Forearm

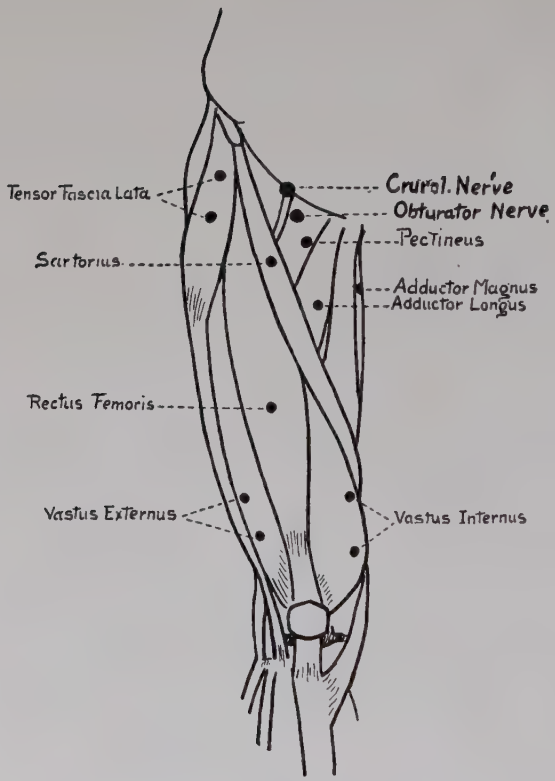

FIGURE 18

Motor Points on Anterior Surface of Thigh

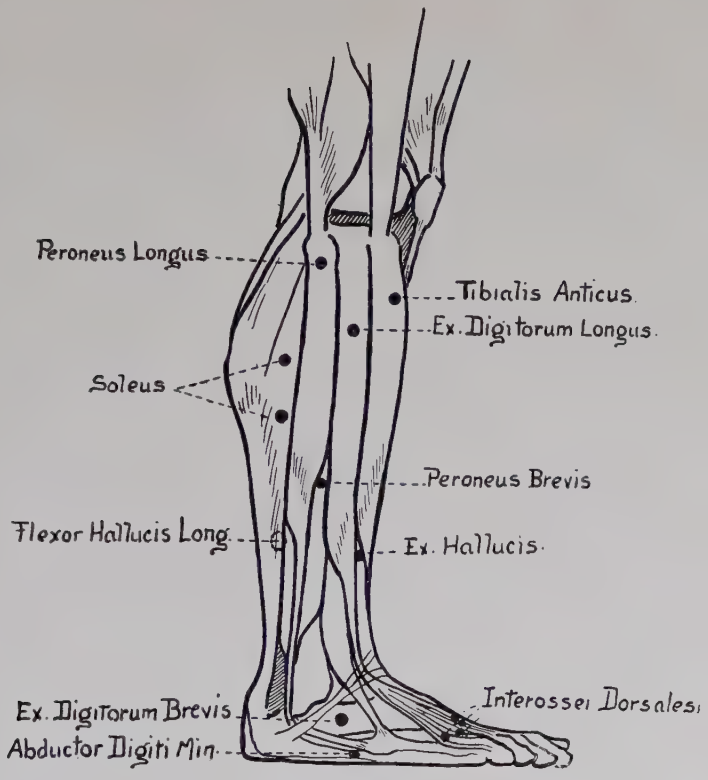

FIGURE 19

Motor Points on External Surface of Leg

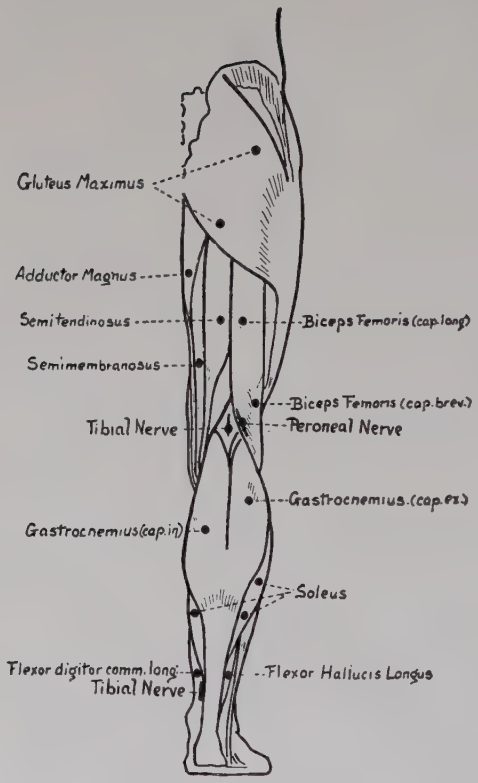

FIGURE 20

Motor Points on Posterior Surface of Leg

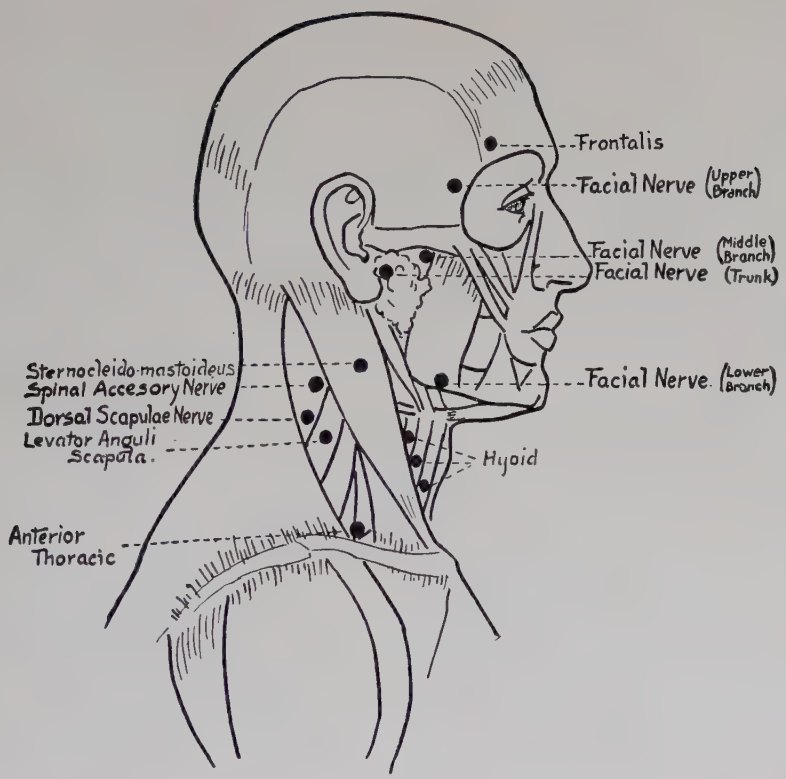

FIGURE 21

Motor Points about the Head and Face

For testing muscles about the face, the indifferent electrode should be placed on the cervical spine, and the active electrode on the face as illustrated in Figure 22.

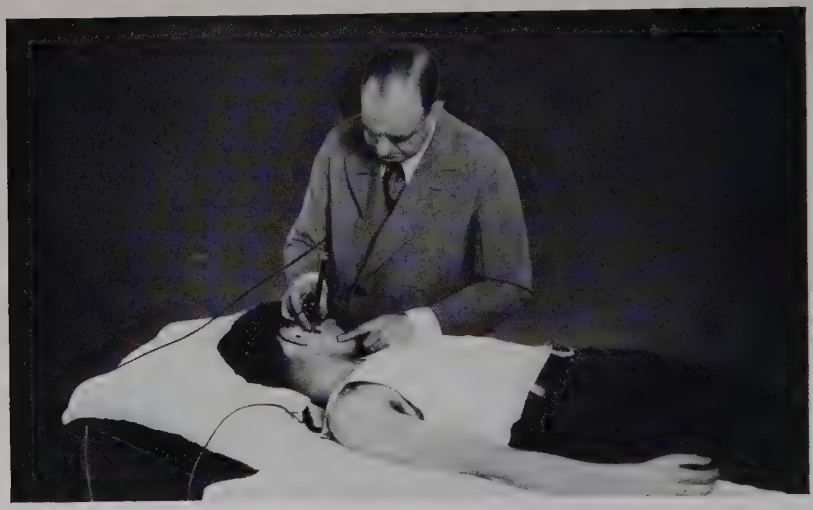

FIGURE 22
Testing Facial Muscles

In Figures 23 to 24B a similar plan is being carried out on the arm, isolating the muscles which seem to be devoid of normal functional ability. The electrode for "muscle testing" here illustrated has an interrupter on the handle. This simplifies the process of producing contractions and is far superior to the method of putting an electrode on and off. Figure 12 shows this electrode more in detail.

This same procedure applies equally well when examining a muscle of the leg. In every case, first determine the condition of the same muscles on the opposite side of the body. Figures 16 to 21 indicate the nerve exits where the electrodes should be applied.

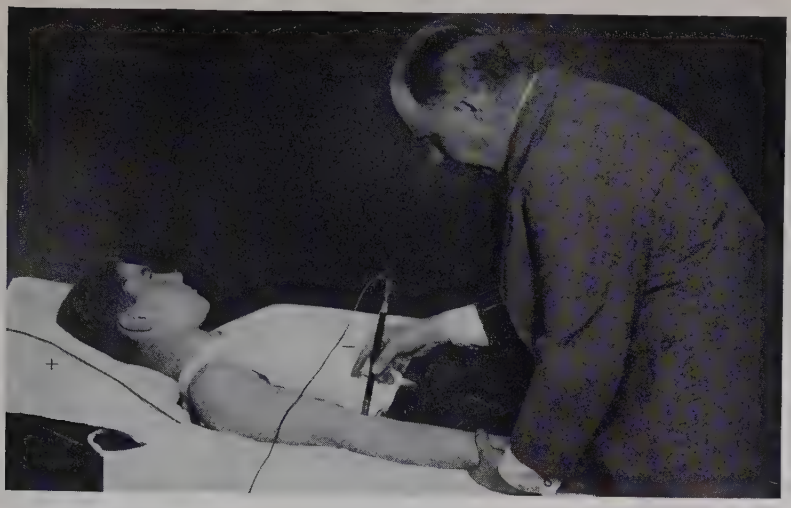

FIGURE 23
Testing Muscles of the Arm

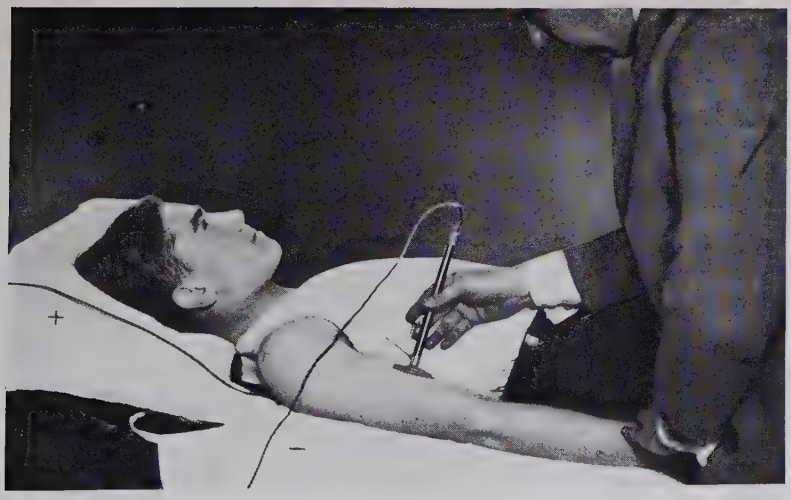

FIGURE 24
Testing Muscles of the Arm

FIGURE 24 A
Testing Deltoid Muscle

FIGURE 24 B
Testing Ulnar Nerve

CHAPTER VII

COSMETIC EFFECTS OF GALVANISM

FREQUENTLY, physicians using galvanism overlook the fact that they have a valuable means for the removal of superfluous (facial) hairs, warts, moles, port-wine nævus, tattoo marks, and the like. With the exception of dessication for removal of papillomata, negative galvanism (electrolysis) is the ideal method. Cicatricial tissue can be relieved, if not entirely obliterated, by needle electrolysis and often by ionization with thiosinamin, sodium salicylate, sodium chloride, or magnesium.

Figure 25 shows the method of applying sodium chloride (5%) with an electrode having a metal contact of aluminum under the saturated absorbent cotton. When this is applied to scar tissue following a burn, the active electrode is attached to the negative pole with the indifferent or positive electrode on the back. The current strength can vary from three to ten milliamperes, according to the patient's toleration, and treatments should last for at least twenty to thirty minutes and occur about twice weekly.

Figure 26 illustrates a depilation procedure which is usually successful if properly carried out, but equally disappointing if not detrimental when the work is done carelessly. It will be noticed that the needle is being inserted in the direct line of the hair follicle — this is important. The face at the point of insertion should be pinched slightly and a quick puncture made with the needle which is connected with the negative pole. In

order that the current may be made as agreeable as possible to the patient, the rheostat or current controller may be dispensed with and the patient, by pressing a small portion of the hand on the electrode and gradually increasing the area of contact, controls the amount that can be easily tolerated.

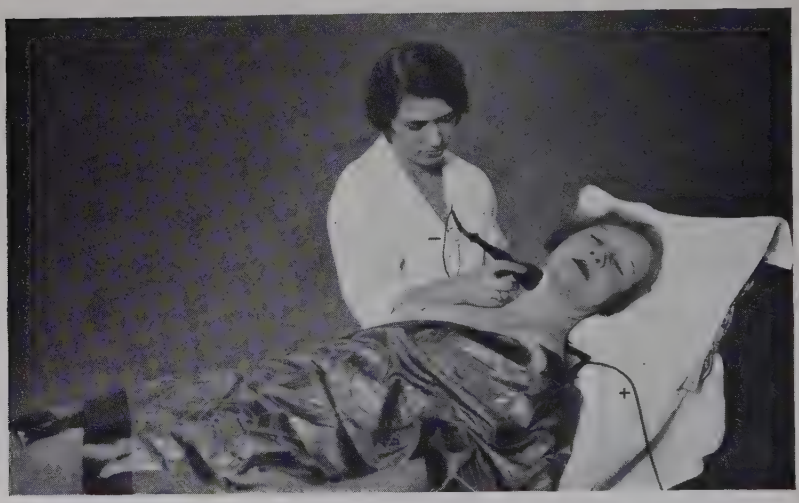

FIGURE 25

It is usually good technique to allow the needle to stay in place until little bubbles of froth are seen. When those appear, the patient gradually — never quickly — removes the hand, repeating the procedure with each hair (Figure 27). The proper current strength must first be ascertained by placing the needle on the moist electrode. Afterward, when the patient's hand contacts with the electrode, only one third or one fourth of the strength recorded will actually be in use, and this will be as much as the patient can easily tolerate.

In perfecting his skill with this procedure, some experiments will have to be made and a little intelligent

FIGURE 26

FIGURE 27

judgment exercised before the operator can establish a definite routine. The same process, only requiring a stronger current, will remove warts, moles, etc., but is infrequently used because of the quicker dessication method.

A skillful operator will soon learn from the touch of the needle whether it has followed the sheath down to the papilla or has pierced the sheath wall. The depth depends upon the size or coarseness of the hair and for large hairs it is usually an eighth of an inch. To determine whether or not the electrolysis has continued a sufficient length of time, simply attempt a slight traction on the hair with a pair of tweezers and ascertain whether

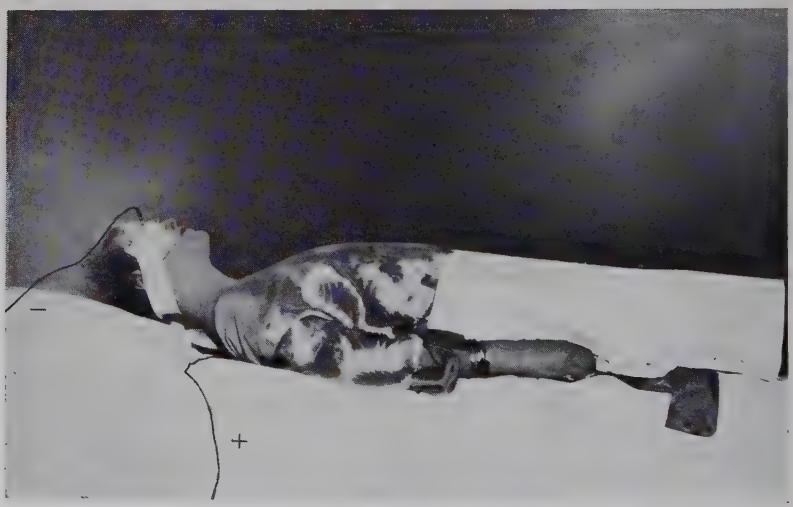

FIGURE 28

or not it is loose. (For more complete information regarding relief of obnoxious blemishes by electrolysis, we refer the reader to the works of Dr. Massey and Dr. Waddington.)

The operator in perfecting his skill should make some experiments on a piece of meat or on his own person, that he may be able to use better judgment as regards strength of current and time of application.

Taking advantage of the fact that the action of the negative pole causes a temporary congestion and increased local nutrition, galvanism, when of sufficient strength, may be used on a woman's face to retard the progress of wrinkles. As the increased vascularity of any certain part is the one essential to increasing deep nutrition, negative galvanism can at least retard the changes that naturally take place as age progresses.

This is especially true where for years there has been a consistent daily application of oily cosmetics. Too much, of course, must not be expected from a person of advanced age, or from one where tuberculosis or other constitutional diseases prohibit a desirable result. Other things being equal, however, if one cares to be persistent, a freshened appearance of the skin may be brought about by use of the Galvanic Current.

The technique would be to place a moist electrode not less than 4 by 5 inches in size on the lower cervical region, and attached to the positive terminal. The other terminal (negative) should be used on a much smaller electrode, so as to concentrate the current on the desired areas, as shown by Figure 28.

The smooth current should first be applied, using strength which can be comfortably tolerated. Five to ten milliamperes, for about ten minutes or until an active hyperemia is established, is a good technique; this to be followed by a unidirectional surging current over the same areas, inducing mild contractions, for not over two to five minutes. The applications may be made every second or third day according to the reaction produced, viz.: vertigo, undue hyperemia and possible headache or

other mental disturbance caused by the stimulation of negative galvanism. This method is contraindicated in case of arterial hypertension.

WARTS AND MOLES

The successful removal of warts and moles can be accomplished by needle electrolysis, by using the same method as in the removal of superfluous hairs. The technique is different, in that the needle is inserted in the base of the growth horizontally, and sufficient strength of current used to cause the appearance of froth, which is the product of the local electrolytic decomposition. (See Figures 26 and 27.)

FIGURE 29

CHAPTER VIII

BRAIN DISEASES OR AFFECTIONS

CEREBRAL HEMORRHAGE

FOR the treatment of cerebral hemorrhage (after the acute stage is past), and for incipient cerebral arterial sclerosis, galvanism has been employed for a long time by the author and with a gratifying measure of success in relieving symptoms.

Dr. Edward C. Titus, of New York, has had extensive experience and has written much regarding this method of treatment. His reports are very encouraging. He recommends fifteen to twenty milliamperes of current to get the best results, and there can be no objection to this if dizziness or syncope does not interfere with the procedure. Moreover, even if this does happen, it will usually be only temporary and not likely to be harmful. Dr. Titus is a recognized authority and his findings can be safely accepted.

Figure 29 shows the general position of the electrodes for successfully carrying the current through the cerebral nerve centers. This position, however, necessarily has to be varied slightly according to the case. Following cerebral hemorrhage, because of the anatomical arrangement of the nerves crossing within the occiput, one electrode is placed on the side of the lesion back of the ear, and the other on the opposite arm as shown. Positive galvanism to the head and negative to the arm is the proper procedure, using three to five milliamperes, for not over ten minutes.

After the acute stage of apoplexy is past, in order to maintain the highest degree of nutrition, use galvanism along the line of the affected nerves. This will hasten absorption at the seat of the injury. In addition, this can be followed during the treatments by a Sine Wave Current of about twenty impulses per minute. Use the Alternating Sinusoidal Current and during its use the electrode should not be placed high on the neck, because it will cause unpleasant contractions of the sternocleidomastoid muscle. It should be placed on the cervical spine opposite the nerve supply to the affected arm, and the other removed from the hand, as shown in Figure 30, and placed on the wrist. Greater toleration of the needed muscle contractions will thus be permitted.

Figure 30

HEADACHE

Headache, as commonly spoken of, arises from so many causes that any attempt to enumerate them would be futile. The causes range all the way from sinus and other infections about the throat and mouth to conditions which are frequently, if not commonly, traceable to colonic toxemia.

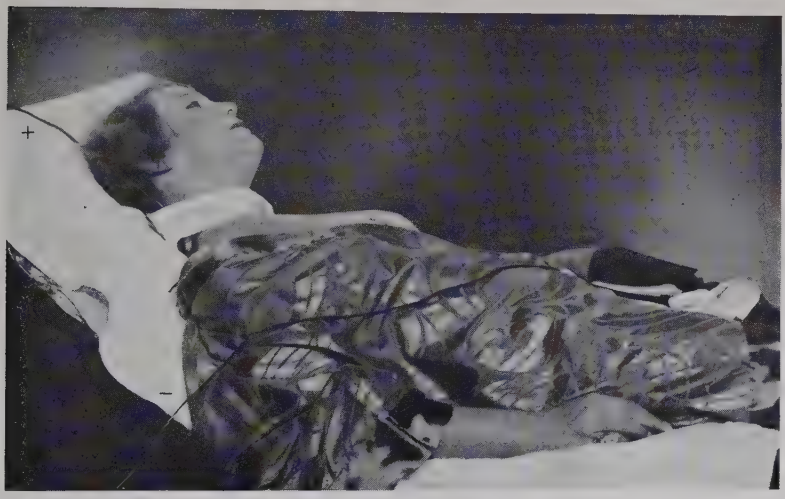

FIGURE 31

Therefore, it is obvious to the physician that any treatment for the pain, if it is to be lastingly effective, must be directed to the underlying cause. However, for temporary relief, positive galvanism to the occiput, as shown in Figure 31, is usually a very satisfactory procedure. Five milliamperes applied for fifteen minutes is amply sufficient.

Also it has frequently been observed that a rapidly Alternating Sinusoidal Current applied to the head, as shown in Figure 29, will afford prompt relief to what is often described as a "tired" headache.

Charcot, of Paris, the renowned nerve pathologist, about thirty-five years ago devised a helmet having a very small electric motor built into the top. This motor, when in action, would produce an extremely active vibration, which he claimed was almost a positive specific for the relief of toxic headaches, especially the form so common in chronic nephritis. The rapidly Alternating Sinusoidal Current seems to meet the same indication and physicians using the low voltage electric currents can frequently provide their patients with relief that is keenly appreciated.

CHAPTER IX

GOITRE

A GOITRE of the noncystic variety will frequently subside to a certain degree following applications of a saturated solution of potassium iodide or sodium iodide, using the negative pole on the goitre and a large positive surface electrode on the back. The electrode on the goitre should be covered with absorbent cotton and saturated with the solution. The effect will be more pronounced if the operator places a small electrode at different points on the goitre, rather than using a large one, which does not concentrate the current so well.

The strength of current should be of easy toleration, and this will vary from five to ten milliamperes. The smaller the amount of current used, the longer can be the duration of the treatment. The average time required is fifteen minutes and it should be repeated every second or third day. (See Figure 25.)

While the above technique is a formula that one is fully justified in attempting, it is frequently disappointing, because after all is said and done surgery is the accepted method most generally successful.

However, in neurotic subjects, after the administration of iodine internally, along with the application of negative galvanism as outlined, subsidence of the goitre is observed sufficiently often to justify its use in selective cases.

Figure 32

CHAPTER X

HYSTERIA

WHEN a neurotic element develops during the course of a disease or sudden explosion of nerve excitability, barring insanity and delirium, the condition is usually called hysterical. Therefore, hysteria is not a disease but rather a symptom accompanying many conditions of perverted function. Its relief, if only temporary, is greatly appreciated by the sufferer.

Local anesthesias, contractures, hysteroepilepsy and aphonia are among common manifestations.

Aphonia has often been quickly relieved by the application of positive galvanism to the occiput with a small negative electrode over the larynx, using five to eight milliamperes for twenty minutes or longer. Sometimes the high-tension faradic coil or rapidly Alternating Sinusoidal Current will be more effective, when used to the point of toleration.

Muscular contractions of a hysterical nature seem to respond to the rapidly Alternating Sinusoidal Current. In making such an application, electrodes of medium size should be placed at the distal attachments of the muscles involved, using a current sufficiently strong and long enough to cause relaxation.

Hysteroepilepsy is often relieved by the application of positive galvanism to the occiput and negative to the solar plexus. The strength of the current should be about five milliamperes, and the treatment last for twenty minutes. (See Figure 32.)

Hyperesthesia of a part may or may not have a definitely impaired function as a cause, but in either case, while a real diagnosis is pending, it is often desirable to relieve symptoms without recourse to drugs. It is here that galvanism can be utilized to meet such conditions as a cerebral hyperemia, which is almost always present in active hysteria. Often a numbness or tingling at the extremities and innumerable other symptoms are traceable to a neurotic state. Positive galvanism to the head or spine, with the negative electrode on the hand or foot (see Figures 31 and 33), using five to ten milliamperes for twenty minutes as often as occasion may require, is suggested.

FIGURE 33

While such applications are usually followed by very satisfactory results, they should, as a general thing, be made adjunct to other treatments for the removal of the existing cause of the nerve disturbance.

CHAPTER XI

AFFECTIONS OF THE EYE

WHEN there is no inflammatory or degenerative change in or about the eye, and especially when massage is indicated, as in drooping eyelids, a rapid Alternating Sine Wave Current of slow impulses may be used for a short period. In granular conjunctivitis, a zinc-tipped electrode, carrying a one per cent solution of zinc or a weak solution of Neo-silvol, and a very mild current from the positive galvanic pole, are a useful application, as shown in Figure 34. Use one to three milliamperes for five minutes.

The current may be simultaneously applied to both eyes (see Figure 34), or, if the case requires, it may be applied to only one by simply detaching one of the applicators. For treating acute conjunctivitis, iritis, or other painful conditions existing about the eye, cover the metal part of the positive electrode with well-saturated absorbent cotton and use a current of two or three milliamperes, holding the electrode in close contact. One or two milliamperes for ten minutes will usually be sufficient for the application.

In retinal hemorrhage or optic atrophy, the general position of electrodes suggested in the foregoing paragraph is entirely proper, but the negative pole, instead of the positive, should be applied to the eye, and then only to a degree of easy toleration. Always remember that having the eye electrode firmly pressed on the lid will allow more current to be used.

If the electrode used on the eye is securely fastened by an elastic band or a bandage, the patient will, in addition to the feeling of warmth about the eye, observe a metallic taste, most noticeable in the vicinity of filled teeth. This is due to the fact that the gustatory nerve is in the circuit.

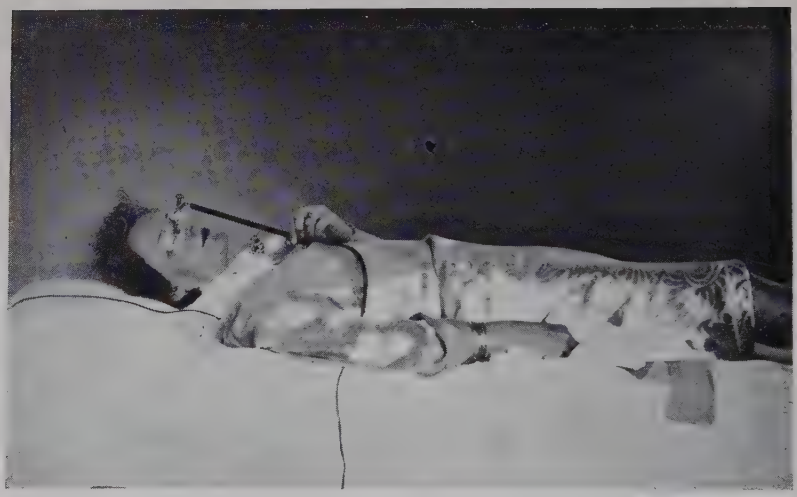

FIGURE 34

On the other hand, if the patient is holding the electrode and allows it to move about on the eye, flashes of light (sometimes unpleasant) will be observed. These are caused by optic nerve stimulation. However, harm rarely results from the effect of the current, although it might disturb some patients.

The only diseases of the eye wherein electricity can be of real value are those in which nutrition of the parts is an element to be corrected, as in optic atrophy, retinal hemorrhage or where the muscles and nerves are affected. The first mentioned is usually treated by the use of the Galvanic Current only and the others by both galvanism and wave current stimulation as may be indicated.

Surgical work about the eye in so far as the use of electrolysis is concerned should not be attempted by any one except an eye expert, who knows the limitations of the weapon used. The older writers, desiring to induce a stimulant action, have advised the use of the combined Direct and Faradic Currents. Since the introduction of the Sine Wave Current, it is considered better technique to use galvanism and the wave separately, thus avoiding the usual unpleasant flashes of light, should the combined current be of sufficient strength to produce the desired invigoration.

Stricture of the lacrimal duct can usually be relieved by the use of a fine silver wire attached to the negative pole, with the positive electrode on the back of the neck. A current of not over two to three milliamperes should be used long enough for the wire to produce the necessary electrolysis. This will be indicated by the presence of a small amount of froth appearing about the silver electrode.

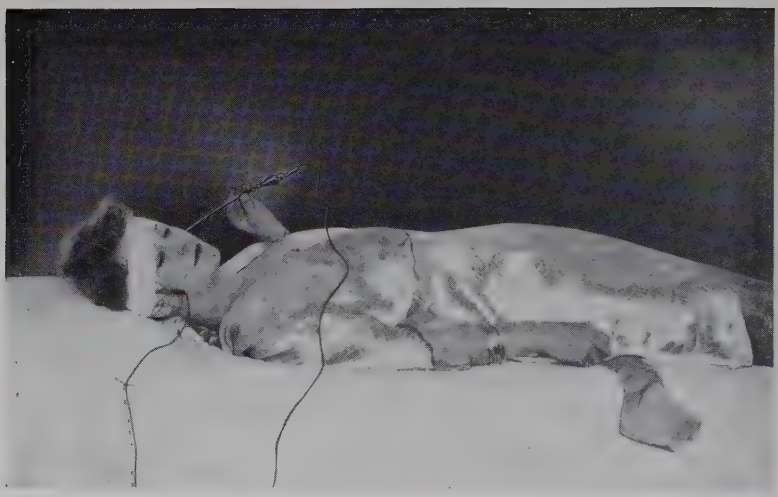

Figure 35

CHAPTER XII

DISEASES OF THE EAR

OTITIS MEDIA is usually treated with good success by applying a zinc-tipped insulated electrode wrapped with absorbent cotton or gauze, saturated with a two per cent solution of zinc sulphate. (See Figure 35.) Use the positive pole within the ear and just sufficient current (one to three milliamperes) for the patient to tolerate easily. The milder the current the longer can be the application. The frequency of treatment must be governed by the judgment of the operator. Here again it is emphatically stressed that in all applications of galvanism about the face, the electrodes must remain absolutely immobile throughout the treatment.

The illustration shows how the electrode may be inserted and held in place by the patient. A small, moist surface electrode has been placed just in front of the ear on the opposite side. This can just as well be placed under the ear or on the neck if it leads to greater convenience. The idea is to have the indifferent electrode so situated that the current will go directly to it from the positive pole in contradistinction to what occurs when placing it under the hand or on the arm on the same side that is being treated. One has only to realize that it is the passage of the current through and not off to one side of the diseased part that brings about the result.

Figure 36 is a specially designed electrode insulated so that the current cannot come in contact with the external ear or any part of the auditory canal, except where the ionizing zinc solution is intended to be ap-

plied. The positive pole contact is made by a socket-and-screw device connected with the zinc lining of the speculum which extends nearly to the inside of the tip, thus allowing a generous dispersion of the current.

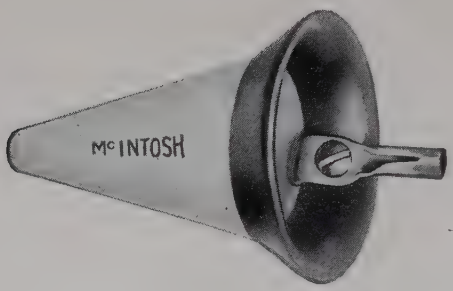

FIGURE 36

While the general procedure here outlined is commonly observed, a majority of operators have adopted individual methods of technique with various drugs, applying them as best suits the case in hand. The foregoing, however, will give a general idea of the application that it is wise to follow. If there is a stenosis of the external auditory canal, or an induration of the eardrum, the active electrode used in the ear should be the negative pole, a saline solution taking the place of the zinc. Under those conditions, application should be made only by a very skillful operator, one who thoroughly understands ear conditions. The strength of current and duration should be about the same as indicated for the positive pole.

The Galvanic Current is of value as an adjunct to the routine and systematic treatment of otitis media. Galvanism, however valuable it may be in causing a stimulating and antiseptic effect on chronic ulcerative processes, should be used in conjunction with well-known measures and only in selected cases, as harm might follow by spreading infection where drainage is imperfect.

TINNITUS AURIUM

Tinnitus aurium is a condition called by the laity "ringing in the ears" and is due to a variety of causes, which, if not ascertained to a nicety, make any therapeutic application only guesswork and more likely to be disappointing than otherwise. Some cases are, of course, incurable because a long-existing nasal or tonsil infection has caused the early exudation to become indurated beyond the reach of benefits from topical applications or electricity. If, however, after all apparent causes have been removed the condition still persists, it is always possible that the induration causing stenosis of the auditory canal may be benefited with negative galvanism. This has an advantage over diathermy, because the softening, dissolving, relaxing, congestive action of the negative pole can be better localized.

Figure 35 illustrates the proper method of applying the Galvanic Current without any medication, as well as the procedure mentioned in the treatment of otitis media. Under these conditions, however, the negative electrode should be used within the ear which gives the patient the least disturbance. If, however, both ears are affected, alternate applications may be made. Use the negative applicator within the ear with a metal-tipped electrode covered with well-saturated absorbent cotton. Any metal will do with the negative pole, care being taken that the wet cotton is wholly within the ear, for, if the rim is allowed to come in contact with the current, it produces an unnecessary burning and itching sensation which the patient will not easily tolerate. The strength of the current should be from two to three milliamperes for ten minutes.

It is usually wise to explain to the patient that the result may not be entirely successful, but if, after two

weeks of treatments every second day, the patient says that the "ringing" is becoming less, one is justified in persisting. If at the end of that time no results are discernible, it would be useless to continue. The author, however, feels justified in advocating the treatment for selected cases because of the fact that, in many instances, it has been observed that favorable results were forthcoming.

If the patient complains of dizziness during an application of galvanism to the ear or ears, it does not necessarily mean that the treatment is contraindicated, but a milder current should be used.

EARACHE

There is often a condition of so-called "earache" which at times is very distressing and where it is difficult to ascertain the cause, although in the majority of cases it is due to some latent infection in the teeth, tonsils or sinuses. For the symptom of pain alone, the Galvanic Current can be used through the ear, having the positive pole over the painful area, or a large (surface) electrode placed just back of the ear, and the negative on the opposite side of the neck. Three to five milliamperes for ten minutes will usually be sufficient to relieve such a condition.

CHAPTER XIII

NASAL DISEASES

ATROPHIC RHINITIS

THE nasal cavity offers a favorable field for the application of galvanism in atrophic rhinitis, which is slow in responding to the usual medicinal topical applications.

The use of a small metal-tipped electrode covered with moist absorbent cotton can be carried nearly if not quite in contact with the Schneiderian membrane. A positive moist electrode is placed on the upper cervical region and the negative, as described, within the nasal cavity. Use a current strength of from three to five milliamperes for ten minutes. The application is usually followed by a feeling of warmth and often an increased secretion; also, incidentally, by a feeling of relief.

HYPERTROPHIED TURBINATES

Figure 37 illustrates the application of the Galvanic Current for treatment of hypertrophied turbinates and similar conditions in any portion of the nasal cavity. This is accomplished by use of an insulated electrode, and one carrying a polished tip of either zinc or copper for the purpose of ionization is most commonly used. Treatment can also be successfully carried out by wrapping absorbent cotton over the tip of the electrode and using a solution of zinc, copper, or, in fact, any other medicant that is indicated.

It is advisable to have the patient seated in a comfortable chair having arms so that the elbow may be supported while the electrode is being held in place, or the patient may recline as shown by the illustration.

The indifferent electrode should be so placed that it cannot by any chance be moved and the lower cervical region is usually selected. Suitable contact can be easily maintained by simply the weight of the patient's body

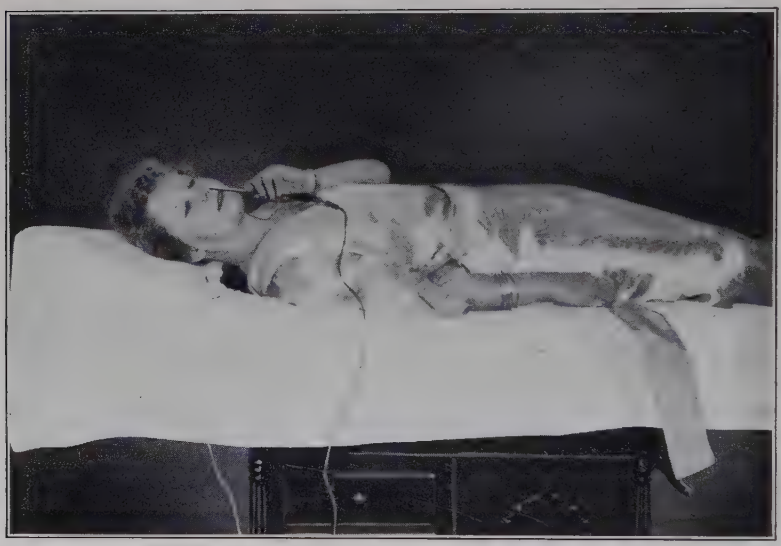

Figure 37

when reclining on the couch or by the aid of a cushion properly adjusted to the back of the chair.

As a certain amount of chemical action necessarily takes place, the tissues must have sufficient time to recover therefrom. It would be a mistake, therefore, if applications were made too often. At least four or five days should intervene between treatments.

The drugs heretofore mentioned should be applied from the positive pole within the nose. If, however, iodine in any form is to be applied, the nasal electrode should be the negative pole. The strength of current in any case may vary from two to five milliamperes and five minutes is usually sufficient duration.

If sneezing prevents the proper application of this treatment, a local anesthesia within the nostrils will as a usual thing obviate the hindrance.

CHAPTER XIV

IONIZATION

CATAPHORESIS, which means the introduction of drugs through the skin or mucous membrane, is a process more typically mechanical than chemical. The drug is forced in the direction of the current and deposited two or three lines beneath the surface. In properly selected cases, however, a sufficient quantity of the drug to be of great service can be introduced. An electrode for the purpose should have a gold or carbon base. Carbon is usually selected because it is far less expensive. Cataphoresis should not be confused with electrolysis, because electrolysis can only take place by the decomposition of tissue itself.

Ionization will be mentioned herein only so far as it affects technique. A more detailed explanation of the subject will be found in Waddington's "Practical Index on Electro and Photo Therapy," Massey's "Practical Electro Therapeutics," and in "Galvanic Currents and Low Voltage Wave Currents in Physical Therapy," by Massey and Morse.

Some definite essentials must be observed in the technique of application, because if they are not the results are apt to be disappointing. It must be remembered that nearly all metals except platinum, gold and carbon are oxidized by the positive pole. Therefore, in attempting to use other metals, the active electrode must in itself be as far as possible free of any mineral content that might retard or conflict with the proper passage of the drug being used. A small piece of aluminum plate, covered

with absorbent cotton, if kept polished and only a small amount of current used, will usually take the place of the carbon or other metals mentioned. It is better to use several layers of absorbent cotton or gauze rather than the usual surface electrodes because of the mineral that collects in them from the tap water. This applies, of course, to the active pole, as the indifferent electrode is negligible except to help convey the current.

FIGURE 38

Figure 8 is a good illustration of a cataphoric electrode having a rubber protecting surface and a depressed carbon treatment area, in which may be placed absorbent cotton saturated with the solution to be used.

Figure 38 shows facial neuritis being treated by a solution of aconite and chloroform, the indifferent electrode being placed in the upper cervical region. It will be observed that the electrode on the face is over the

main branch of the trifacial nerve, thus allowing a greater distribution of the current itself. Quinine in solution is used for the same purpose and with the same technique. This technique may also be used in other parts of the body when desirable. When applying cocaine for local anesthesia, a ten per cent solution is usually employed. The strength of current can vary from one to five milliamperes according to the sensitiveness of the part of the body where it is used. Usually it is advisable to begin with a very small amount of current and gradually increase as the pain is relieved, reasonable care being used not to prolong the effect beyond what is strictly necessary, because of the possible depressing effect of the drug itself.

The instructions as given in the foregoing paragraph are for aconite, cocaine and quinine, to be used from the positive pole. If salicylic or iodine solutions are to be applied over a noncystic goitre or about an arthritic joint, the negative pole should be the active one.

If a larger electrode than is obtainable in the market is desired for cataphoric medication, a piece of aluminum may be procured and cut in various sizes as needed. Its oxidation and resistance are not to be considered when such a small quantity of current is to be used. However, care should always be taken that the metal does not lap over the edges of the moist material and burn the skin.

In connection with ionization, the proper number of milliamperes cannot be definitely specified, the same as is advisable with most conditions mentioned in this book. The toleration of the patient should be the guide to the strength of current used, and less time should be given to the application if the current is strong than if a mild current is employed.

Furthermore, in ionization work, one should not be too sanguine of obtaining equally brilliant results from

applications to the skin as from those made to mucous membranes, except where there is a granulating surface. A careful selection of the drug best suited to the diseased area under treatment is highly essential. When this is carried out ionization usually proves a very satisfactory form of local medication and frequently prevents surgical interference.

As physicians cannot always carry in their minds the exact dosage of drugs to be administered or applied, the following formulæ, outlined by Dr. A. R. Friel, of London, are quoted:

ZINC SOLUTION

℞ Zinc sulphate ..... 75 grains
Glycerin ..... 2 ounces
Water ..... 35 ounces
Sig: Dilute with an equal quantity of warm water at the time of using.

SODIUM SALICYLATE SOLUTION

℞ Sodium salicylate ..... 175 grains
Water ..... 1 pint
Sig: Dilute with equal quantity of warm water just before using.

SODIUM CHLORIDE SOLUTION

℞ Sodium chloride ..... 175 grains
Water ..... 1 pint
Sig: Dilute with equal quantity of warm water just before using.

ZINC GELATIN

℞ Zinc sulphate ..... 8.75 grains
Gelatin ..... 65 grains
Water ..... 1 ounce

This zinc gelatin may be prepared and kept in tubes. The contents may be liquefied just before using by immersing the tube in warm water.

FIGURE 39

Dr. Leduc, of France, is a strong advocate of the use of chloride of sodium in a one and two per cent solution, applied to scar tissue and ankylosed joints, using the negative as the active pole. A pad, having considerable thickness of absorbent cotton, saturated with the sodium chloride solution of the strength suggested, may be applied to the part under treatment. The other surface electrode should be placed opposite, so that there can be no diverting of the penetrating process. The strength of the current depends upon the portion of the body under treatment, but usually ten milliamperes is sufficient to start with. After a short time this can be gradually increased until three or four times the amount of

FIGURE 40

the initial milliamperage can be borne. Prolonged applications are advisable, lasting not less than thirty minutes, but applications are not to be made more often than twice a week at first, and, as conditions improve, once a week.

If the hands or feet are to be treated, the saline water-bath method may be preferable (see Figures 39 and 40). When using sodium salicylate or sodium iodide, the strength of current should be the same.

Ionization has been attempted by only a comparatively few physicians who are doing physical therapy work even though they are using galvanism in their everyday practice.

Leduc of France, Friel of London, and Massey in America have been three outstanding students who have made special study and have written much along the line of direct medication. Massey classifies the process as "the application of medicinal ions and surgical ions"; the latter he also classifies as "sterilizing ions, which are practical electrochemical curettages. The advantage of this is that the absorbent vessels and lymph spaces surrounding the seat of the operation are not opened by electrosurgical intervention, but rather are sealed by it, the edges remaining sealed by the coagulant action of the ionization until replaced by the sealing effect of tissue repair. This minimizes the possibility of reimplantation of undestroyed or unremoved organisms, and this has the advantage over the usual surgical procedure because the devitalized débris may be left in or about the region thus operated upon, with a possibility of subsequent absorption."

Zinc, copper, silver and mercury or mercury combined with any of the other metals are sources of the surgical or sterilizing ions. Again quoting Massey from his "Practical Electro-Therapeutics," "Medicinal ions are

those ions which, when diffused into a part of the body by electric power, form noncauterant molecules in the tissues and fluids by union with opposite body ions, molecules which do not differ in action from the same chemical substances inserted into it in any other way, except that, when driven in as ions, they have been driven into immediate union with intracellular substances near by as well as into the fluids; that they can be made a part of the circulation and tissues in a portion of the body without a general administration of the remedy; and that they remain in the local tissues longer than when administered differently, indicated by slower elimination."

The drugs commonly used are chlorine, lithium, the salicylates, quinine and iodine, and are applied from the positive or the negative pole as they may be electropositive or electronegative. This is elsewhere explained more fully.

CHAPTER XV

ARTHRITIS

ARTHRITIS, whether caused by a traumatic or an infectious state, commonly includes a vast array of symptoms not only involving joints, but myofibrous tissue as well. If the origin is traumatic, galvanism, applied to the joints or through painful muscle areas, usually relieves pain and hastens recovery. In the infectious type of arthritic disturbance, galvanism or any other form of local treatment is likely to give but temporary relief because of the underlying cause, which is usually teeth, tonsils or colon.

However, in conjunction with a restricted diet and local applications for relief of the infected areas, galvanism is as fully indicated as diathermy, which is perhaps more commonly used. The latter sometimes has inferior and at other times superior efficiency. Ionic medication with sodium salicylate (two per cent) is often good technique when applied to the smaller joints through the medium of small electrodes on the joint or in the medicated solution. Use a current ranging from ten to twenty milliamperes for twenty minutes.

The fact that arthritis presents so many phases and often persists in developing until the sufferer is relegated to the wheel chair or bed, regardless of any measures which even the last word in medical science can offer, it behooves us as physicians to be very cautious about any promise of relief or cure. However, there can be no doubt that physical methods do play an important part in the relief and sometimes apparent cure of arthritic

cases which have not reached the stage of deformity and fixed adhesions.

In this connection, the subject of galvanism deserves careful study, and the action of this current at the negative pole should be clearly understood. This book devotes several pages to the subject and a careful review of them is earnestly recommended. The information to be derived therefrom can be made very helpful. Physicians who act on it and apply galvanism under these and other similar conditions, even though they have previously looked upon diathermy as the only physical procedure worth considering, will often be surprised and gratified as well.

FIGURE 41

Figure 39 shows a method of passing galvanism through the hand when placed in a glass or porcelain dish containing a weak salt solution or other medication; such as, for instance, sodium salicylate when used

for the treatment of arthritis in the fingers. Under those conditions, the negative pole is in the solution.

For inflammatory swellings about the wrist and hand, where there is no confined infection, a solution of sulphate of magnesia is often very effective. In that case, the positive pole is in the solution, using a strength of current to the point of toleration. This is on the principle of the Epsom salt poultice for acute swellings, only there is added efficiency from the contracting and sedative action of the positive pole. The same principle, of course, would apply to the feet. (See Figure 40.)

Figures 30 and 41 illustrate how the parts may be treated by wrapping with a saturated solution, and this method will be found equally convenient and efficacious.

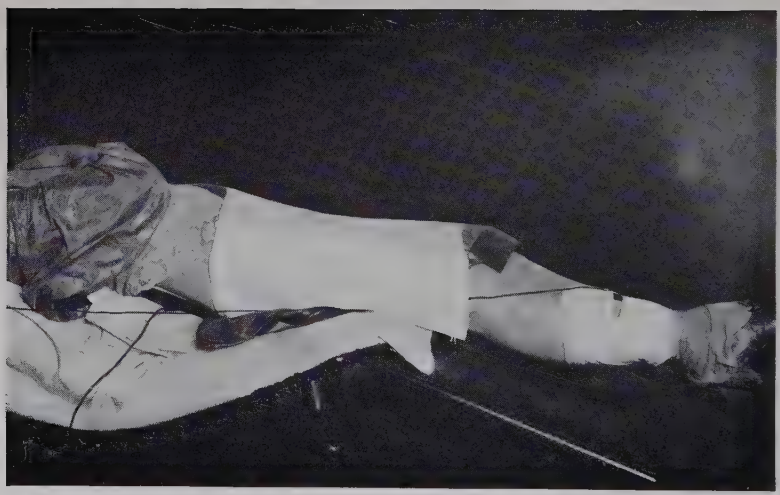

FIGURE 41 A

CHAPTER XVI

SCIATICA

PAINFUL conditions, from the lumbar spine to the toes as a general thing, may be compared with those described in the arm, only there is a greater variety in which the application of electricity is indicated.

Sciatica, as a usual thing, can be quickly relieved by applying ten milliamperes of galvanism, with the positive electrode on the lumbar region and the negative wrapped tightly about the ankle. (See Figure 33.) The application should last about twenty minutes. A stronger current than this, even though easily tolerated, is not advisable because after a few minutes the patient (especially if a muscular subject) is likely to have an uncomfortable feeling of contraction in the leg, due to the suddenly increased blood supply produced by the current. This would cause more severe pain than that for which the patient is being treated, even though it was only temporary. Therefore, the operator should be guided by the milliamperemeter and not by the patient's sensations or suggestions.

After all, the foregoing is mainly for the relief of pain, and the underlying cause must be determined and cared for accordingly. It may be located as cecum or sigmoid toxemia, a sacroiliac luxation, the effects of a spinal disease, or traumatism. For the immediate relief of pain, however, the application of galvanism in this way will usually bring quick relief, gratifying to both physician and patient.

The electrode should be placed on the outside or inside of the ankle, according to the painful area involved, but not under the calf of the leg because it is likely to produce an undesirable muscular contraction at that point. (See Figure 41 A.)

FIGURE 42

Figure 40 illustrates an application of galvanism extending the whole length of the leg and thigh, with the foot in a glass or porcelain basin containing a mild saline solution. The negative electrode is placed in the solution and the Galvanic Current employed. This technique would apply equally well to cases of defective circulation in the extremities, due to sclerosis, arthritis, neuritis, numbness, etc. It is especially good for old people commonly described as having "poor circulation." Sometimes the value of electrotherapy is enhanced by using the Faradic or rapidly Alternating

Sinusoidal, following the water-bath method just described. The Galvanic Current strength should be from ten to fifteen milliamperes and the Alternating Sinusoidal to the point of easy toleration, allowing about twenty minutes for the entire treatment.

SACROILIAC SPRAIN

Except for the polarity indicated in this picture, Figure 42 shows the application of galvanism through the upper portion of the sciatic nerve, as treatment for localized neuritis. The positive pole should be on the back and the negative on the inner side of the thigh, and can be held in place as shown by a double sandbag, or a bandage. If a sacroiliac luxation which has passed the acute stage is to be treated, the same position of electrodes is used, only the negative pole would be on the back. Ten to fifteen milliamperes should be used, followed at first by a Galvanic Wave Current for a short duration, and later with stronger galvanic wave or sine wave surging applications, the strength of which must be determined by the reaction about the joint involved.

CHAPTER XVII

NEURITIS

A PAINFUL condition developing about the shoulder and arm and extending from the spine to the tip of the fingers may not necessarily be the result of disease, such as infantile paralysis, paralysis agitans, or progressive muscular atrophy, but originate from some foci of infection, such as teeth, tonsils, sinuses, intestinal toxemia, or local purulent areas. The cause of this must always be taken into consideration and treated. However, even if the apparent cause has been removed by surgery or otherwise, any pain and inability must always be considered as a symptom and combated. Here is where the value of treatment by physical methods surpasses that of any other, including splints, rest, liniment, sedatives, stimulating drugs, or hand massage. These, while often useful, bring at best but a feeble attempt in the right direction.

In a large majority of cases, the low volt currents are best adapted, and that is not casting any reflection upon the valuable use of high frequency and the modern light applications. In fact, it often becomes a fine distinction in determining which treatment would be more advisable. The general statement might be made that negative galvanism, when properly localized, is akin to diathermy in proportion to the existing fibrosis under consideration and the chronicity of the case. Positive galvanism with its interpolar action is best where pain, paralysis and a general defective nutrition of the arm are the elements involved.

Figure 30 shows how a current of electricity can be carried through the arm to the tip of the fingers or in the opposite direction if so indicated. It is commonly undesirable that the palm of the hand should be used as a contact, on account of the resistance of its thick skin. To overcome this resistance, as will be noticed in the picture, the back of the hand is covered with wet chamois, folded about the fingers, so that the current is distributed evenly about the hand. This diminishes the resistance which would be natural if the palm were the only contact. A flat sponge, flannel, spongiopiline or absorbent cotton saturated may be used in place of the chamois. Chamois is considered preferable because of its convenience and ability to carry the current.

Figure 14 gives a fairly clear impression of the spinal nerve supply to the viscera and down the arm, also the relationship of the lumbar region, and shows the origin and a section of the sciatic nerve. A physician is frequently asked to explain the cause of certain painful areas and although he may convince the patient that he knows the real reason, a mere verbal explanation does not, as a rule, give as clear a conception as the case deserves. Hence, it is suggested that this, or a similar nerve supply chart, could be used in such cases with good results. A clear and complete explanation by the aid of pictures is not only perfectly ethical but advisable, as it tends to strengthen the faith of the patient in any physical procedure that is adopted.

Small, localized areas of neuritis, such as frequently develop from a traumatic cause, are usually amenable to the Galvanic Current. The positive pole is indicated if the case is acute, and the negative if it is of sufficient duration, or where secondary changes have taken place in the tissues, such as adhesions and infiltrations, and a softening effect is needed in order to relieve the pressure

by hastening absorption of the inflammatory product. The scientific designations of this condition include herpetic neuritis, coccygodynia, torticollis, tic douloureux, gastralgia, intercostal neuritis, lumbago and sciatica, and the methods of treatment are being described. (See Figures 43, 44, 45.)

Figure 43

In acute cases where the positive pole is the active electrode, a mild current of five to ten milliamperes, lasting from ten to twenty minutes, usually relieves pain more effectively than a stronger current. On the other hand, where the negative pole is indicated, a stronger current seems to be more effective. Whenever it is practical, the current should be caused to pass lengthwise of the nerve, but a current sufficiently strong to cause muscular contraction over the inflamed or painful nerve will almost invariably aggravate the condition. It is here that the milliamperemeter must be the guide and not the

FIGURE 44

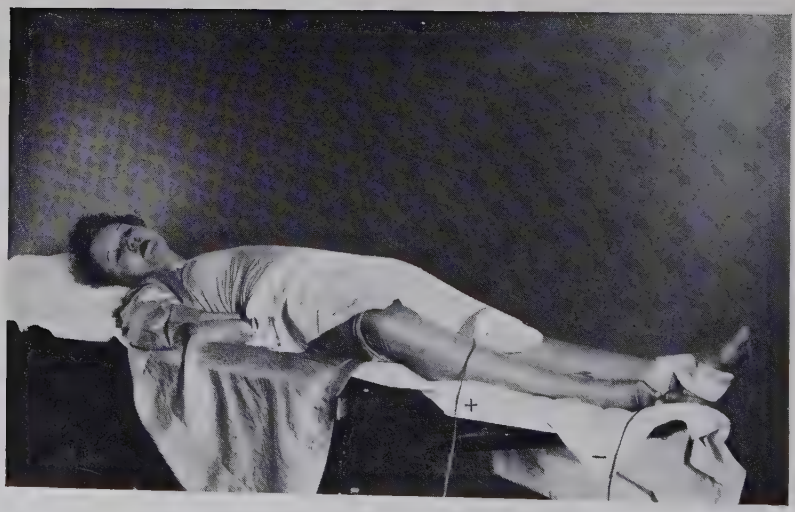

FIGURE 45

patient's sensation. That very troublesome and persistent condition known as herpetic neuritis, which usually continues long after all symptoms of the disease, *per se*, have disappeared, is relieved most effectively by the use of a mild current of galvanism, five to eight milliamperes, through the part. The electrodes should be so placed that the current will follow the course of the inflamed nerves — the positive nearest to the spine and the other at the distal extremity. As this form of neuritis is very persistent, daily applications should be made.

FACIAL NEURITIS

Figure 38 shows the method of applying galvanism for the treatment of facial neuritis. The positive pole is in contact with the face and the negative pole with the cervical or upper dorsal region. The strength of current should not be more than five milliamperes and the length of application from ten to fifteen minutes.

It is not advisable for the patient to attempt to hold the facial electrode. Any variation of pressure or movement of this electrode would be likely to result in flashes of light due to optic nerve stimulation and thus unnecessarily disturb the patient. The use of an elastic band, as illustrated, is an ideal means of holding the electrode firmly in place and causing the least possible discomfort.

If, for any reason, the application when carried out this way results in temporary pain, reduce the current strength two or three milliamperes and then increase it very slowly to the point of comfortable toleration. Usually, if the facial electrode is not exactly in the position it should be, or if it is not sufficiently saturated, an unpleasant burning sensation will be felt.

As before stated, the negative electrode should be on the cervical or upper dorsal region. This insures the most direct current effect through the parts being

treated. This is very important, because if placed under the hand, the slightest movement of the fingers would be liable to produce painful shocks about the face. The natural resistance in the palm of the hand prevents the proper flow of the current.

COCCYGODYNIA

Coccygodynia is another form of neuritis affecting the terminal of the sacral nerve supplying the coccyx. This usually follows injuries such as those caused by childbirth, or a direct blow. Positive galvanism from a small surface electrode, covered with chamois or cotton to assure better contact, and placed directly on the coccyx, with a larger indifferent electrode on the abdomen is the proper technique. A current strength of five to eight milliamperes should be used for fifteen minutes every second or third day.

TIC DOULOUREUX

Tic douloureux is a spasmodic affection of the face, neuralgic in character. This is often controlled by the application of positive galvanism three to five milliamperes as illustrated in Figure 38. Treatments should last for ten minutes and in severe cases, applications may be made daily.

GASTRALGIA AND INTERCOSTAL NEURITIS

Gastralgia and intercostal neuritis are frequently relieved by applications of galvanism through the parts, placing the positive electrode on the most painful portion and the negative on the opposite side of the body. The current strength should vary from ten to fifteen milliamperes; that is, if the patient is a stout person, the greater distance between the electrodes requires more current than would be needed by a thin person.

CHAPTER XVIII

LUMBAGO

PAIN developing along a nerve or set of nerves, when aggravated by pressure or motion, is usually spoken of as "neuritis." The treatment can be simplified because one knows just where the trouble begins, and the pain over the ramifications of the nerve involved is only incidental. Here is where galvanism, positive above and negative below, as would apply to the extremities, is indicated. A mild current should be employed, ranging from five to twenty milliamperes, according to the part of the body involved. The distance between the electrodes, as it governs the resistance encountered, should consequently be a guide to current strength in many cases.

If the painful area to be treated is of long standing, the negative should be the active electrode, with the positive placed at an opposite point, as in Figure 46, showing treatment of a so-called "chronic lumbago." If the existing neuritis is from an infectious origin, such as colon toxemia or infected tonsils, causing more or less intermittent and recurrent pains in different parts of the back, the use of mild galvanism, as above outlined, will usually give relief to the painful areas while the real cause is being eliminated, thus saving the possible unpleasant after-effects of anodyne drugs.

As elsewhere stated, while a current of galvanism is being passed through an inflamed nerve, the electrodes should be kept absolutely quiet. Also in all forms of neuritis, whether acute or chronic, one should not allow

the patient's sensation in the region of the electrode to govern the amount of current needed. The milliamperemeter is for that purpose. A neuritis is often aggravated by following the patient's suggestion that a little stronger current be used.

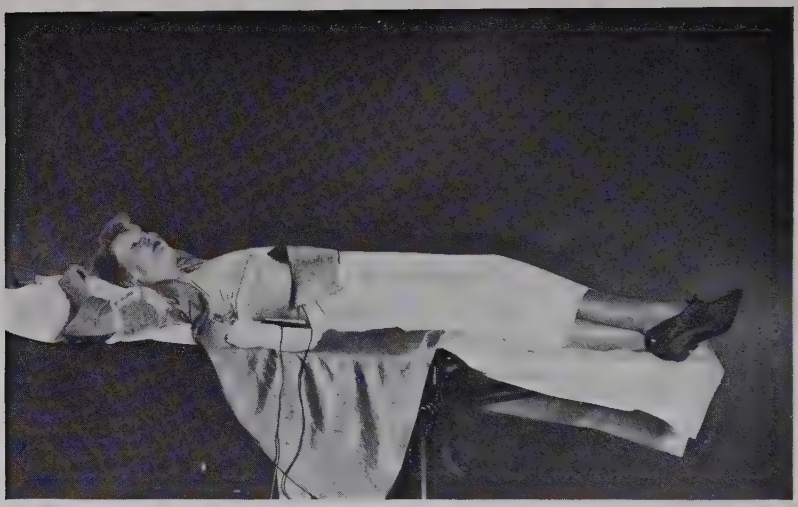

FIGURE 46

CHAPTER XIX

MISCELLANEOUS

TORTICOLLIS

TORTICOLLIS is a condition usually resisting all forms of physical treatment. Therefore, no matter what application is attempted, if the patient is to derive any benefit therefrom the technique necessarily has to be adjusted to a nicety. This affection, if of long standing, usually partakes of the nature of paresis or a spasm.

The spinal accessory nerve which supplies the sternocleidomastoid and trapezius muscles may through injury or infection be the source of the disturbance. The object of treatment is, when possible, to relax the contractions of the muscles mentioned, and restore the tone of the weakened muscles, because they have been thrown out of commission, so to speak.

A technique that often results in relief is the application of negative galvanism — two to five milliamperes over the upper portion of the muscles involved, placing the positive electrode on the upper cervical spine. Such a mild current as this may be continued from fifteen to twenty minutes. On the relaxed muscles on the opposite side, the sinusoidal, sufficient to cause quite vigorous contractions, should be used, but only for a short period. Applications, ordinarily, should be made every second day. If after about six treatments have been given as outlined there is a perceptible lessening of the spasm, one is justified in continuing the treatment. Otherwise, it had better be discontinued, as there may be some arthritic element causing a thickening or pressure on the

nerve supply, and because of that more vigorous measures have to be attempted.

In spasmodic contractures, following cerebral hemorrhage and infantile paralysis, also for similar muscular spasms occurring in the extremities during convalescence from injuries or surgery, the same currents and technique of application can be used.

WRITER'S CRAMP

Writer's cramp is a condition where, in addition to other measures, the Galvanic Current is indicated. A positive electrode should be placed on the upper dorsal spine and a negative electrode on the hand, as shown in Figure 30. Eight to ten milliamperes for twenty minutes' duration should be applied two or three times weekly. The antispasmodic and nutritional action of the negative pole explains why relief so often follows its use in these cases. The same form of treatment with same strength of current when applied with the hand immersed in a saline solution, as shown in Figure 39, is another method.

ANALGESIA

Local manifestations of disturbed sensibility are found in various parts of the body following trauma. These sometimes recover independently, but if the injury is severe, or the patient elderly, local stimulation is often a help to restoring function. Such analgesia or anesthesia is frequently a manifestation of hysteria and may be unilateral or bilateral (para-anesthesia) affecting both upper and lower extremities.

Biernacki discovered "that analgesia of the ulnar nerve is a symptom of consequence in locomotor ataxia and in general paralysis of the insane."

Whatever may be the cause, the existing pathology is one of threatened nerve degeneration and consequent

muscular impairment. The indications are to improve the local nutrition and it is here that galvanism more definitely meets the requirement than other physical agents, because of its ability to cause an increased blood supply and consequent nutrition at the negative pole. The strength of current to be used, the time of application and whether or not it should be accompanied by a surging current, depends on the peculiarities of each individual case. A mild current as a rule would be more beneficial. If fifteen to thirty milliamperes were used, as is often advised in such cases, exhaustion rather than recuperation would be likely to follow.

AFFECTIONS OF MOUTH AND THROAT

As a general thing treatment of conditions existing in the mouth and throat by electrical methods is not as feasible as in other cavities. This is because of the difficulty of keeping a metal-tipped electrode correctly placed long enough to obtain results. Cavernous angioma, however, is an exception to the general rule.

For chronic laryngitis, especially in old people where atrophy and relaxation of the vocal cords are symptoms, negative galvanism, as described in the treatment of aphonia, can be applied. Likewise this method is indicated for diphtheritic paralysis, in which case both wave and waveless galvanism should be used.

CAVERNOUS ANGIOMA

In treating this condition, a platinum or gold-pointed, insulated needle at the positive pole should be inserted in the base of the tumor, using current to the extent of the patient's toleration. This will cause a subsidence of the growth. Under no circumstances use the negative pole, as a hemorrhage, which might not be easily controlled, would be provoked.

ADENITIS
LYMPHATIC, CERVICAL AND INGUINAL

Glands of the nontubercular variety, which remain in an indurated condition after the infection causing it has subsided, can often be made to recede more rapidly by the application of a one per cent solution of sodium iodide, as shown in Figure 25, utilizing the negative pole as the active electrode. Use about ten milliamperes for twenty minutes, twice weekly.

ANGINA PECTORIS

In cases of angina pectoris, and so-called "pseudo" angina, if the negative pole is placed over the sternum and a larger electrode on the dorsal region between attacks, ten milliamperes for twenty minutes will often act as a preventive, or mollify the pain during a seizure.

ARTIFICIAL RESPIRATION

To help restore interrupted respiration, apply a small positive electrode over the upper dorsal region, and the negative in the region of the solar plexus, on the abdomen. Use a Galvanic Current of from twenty to thirty milliamperes and reverse it about twenty times per minute. The contractions will be short, sharp and powerful. Such applications may be needed following operations under ether, hysterical and cardiac spasms, and also in cases of drowning.

BURSITIS

In treating a bursitis, electrodes placed as shown in Figure 47, with the larger one on the back and the smaller one over the anterior portion of the shoulder, are proper technique. The electrode on the shoulder should be much smaller than the other, so as to cause concentration at that point. Where iodine, the salicyl-

ates or sodium chloride are applied for a medicinal ionic effect, use the negative pole on the smaller electrode.

In acute bursitis, like any other area in the arm or hand where there is extreme tenderness or acute swelling, the positive should be the active pole. The current strength and the frequency of applications should be governed by the judgment of the operator, but ordinarily five to eight milliamperes for ten minutes is best.

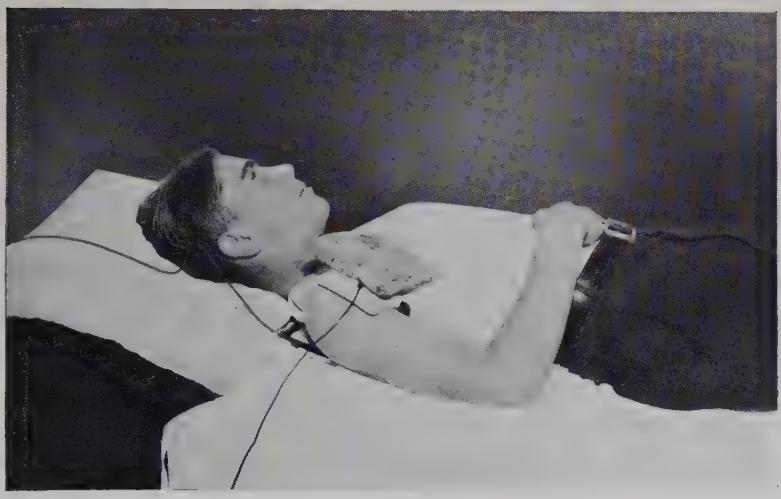

FIGURE 47

The author does not wish to convey the idea that the one and only method of treating bursitis is by physical means, as above outlined. But in cases where the X-ray and the history of the case eliminate the necessity of a surgical procedure, which is frequently encountered, much relief will usually be obtained by using the procedure here described.

ASTHMA AND TACHYCARDIA

Spasmodic asthma, as a general thing, can be relieved by applying the positive pole of the Galvanic Current. A mild current, without interruption, will often cause a definite subsidence of the spasm.

It has often been noticed, especially in connection with hospital cases where there is an opportunity to systematically observe results of treatment, that when asthmatic attacks occur periodically the severity of the spasm is often materially lessened by the use of galvanism. The positive electrode can be applied over the lower cervical region and the negative over the solar plexus, having the pneumogastric nerve in circuit. The strength of current should be about eight to ten milliamperes and the duration of the treatment not less than twenty minutes. (See Figure 32.)

Of course, it is understood that contributory infection may come from the teeth, tonsils, sinus or colon, and its source must be determined and cared for accordingly. Toxemia disseminated from the cecum has been found, by the author, to be a very common cause of asthma.

In those cases, the intensity and frequency of the asthmatic attacks diminished proportionately as the colon infection was relieved by colonic irrigation and stimulation of the muscles induced by wave current applications through the hepatic flexure. The proper technique for this is fully described in the sections devoted to "Colonic Irrigation" and "Intestinal Stasis."

Tachycardia is often relieved by using the Galvanic Current in the same manner as just outlined for asthmatic attacks.

DERMATOLOGY

The use of low volt currents in the treatment of skin diseases has rarely been mentioned by writers, probably because other methods were considered sufficient.

In chronic forms of the parasitic skin diseases, solutions of the usual remedies — namely, boric acid, carbolic acid, zinc sulphate, sodium hyposulphite, mercurial solutions and many others — can be used cataphorically with more rapid results due to the deeper penetration caused by the current.

As an illustration, salicylic acid is a very common ingredient of ointments for the different forms of eczema. If a sodium salicylate solution (two to four per cent) were applied from the negative pole through the diseased area, as per technique given under "Ionization," the penetration would be much more than would be possible for the ointment, as the real pathology exists in the deeper tissue. The same principle would apply equally well to other drugs, if proper care is observed in selecting the right pole for the drug applied. It must be remembered that while the salicylates and iodides would be driven into the tissue by the negative pole, zinc, carbolic acid, etc., should be applied from the positive pole.

This same technique has often been used successfully by the author in applying zinc or carbolic acid for the treatment of pruritus vulvæ and pruritus ani. Many other diseases of the skin might be enumerated, but it would seem sufficient if attention is called to the method, leaving the physician to apply it as conditions arise, using whatever medicament he considers the most desirable.

The endermic administration of remedies by the cataphoric method not only provides a more positive application of the drug designed to destroy the existing parasites, but at the same time the current tends to improve

local nutrition, thus strengthening resistance to further invasion of the disease.

SYNOVITIS OF THE KNEE

Figure 48 illustrates the proper position of the electrodes for treating synovitis of the knee by galvanism. The Galvanic Current when passed through the knee joint hastens the absorption of the fluid accumulation and is usually productive of rapid results, not only in the relief of pain, but also in the diminution of the swelling.

FIGURE 48

It is immaterial that either electrode, positive or negative, be applied to the outside of the knee or vice versa. Quicker results, however, seem to obtain when the polarity is changed on each succeeding application.

Because of the bony contour of the knee, great care should be taken to insure perfect saturation of the electrodes and a positive contact. In placing them, equal

care should be exercised to see that the outer edges of the electrodes are not too close to each other. When placed too close it tends to concentrate the current at a point directly beneath the edges and cause unnecessary heat.

The proper current to be used is the Galvanic, ordinarily of ten milliamperes, and applications should be of from fifteen to twenty minutes' duration.

These treatments should be given daily or at least every second day at the start and later on be followed with applications of the Sine Wave Current to invigorate and restore normal tone to the muscles and entire ligamentous structure of the joint.

ADHESIONS

Adhesions of the smaller joints, which have not become "fixed," as for instance those developing from an arthritic deposit after the acute symptoms have subsided, may sometimes be made to respond to chlorine (sodium chloride), two per cent, or sodium iodide, two per cent. This should be applied in solution from the negative pole to the feet or hands, as shown in Figures 39 and 40. The strength of current may vary from five to fifteen milliamperes, according to the toleration of the patient. The time of application should be at least twenty minutes.

Adhesions following surgery or inflammatory processes in mucous membranes, such as the vagina and rectum, can be successfully treated by iodine ionization. A negative carbon ball electrode covered with absorbent cotton and moistened with the solution should be employed. (See Figures 77 and 86.) The stimulating effect of the Galvanic Current, used through the abdomen where mild adhesions exist, not of sufficient firmness to be a surgical case, may hasten the process of absorption and thus relieve pain in that locality. Ten to twenty

milliamperes should be employed for twenty minutes. If, for any reason, the application is painful, the lesser milliamperage can be used for a longer period and the effect will be the same.

COLLE'S FRACTURE

The deformity following Colle's fracture usually calls for passive exercise and forcible manipulation of the part to prevent fixed adhesions. The average patient will not do this himself nor allow it to be done by others with sufficient strength to make it effective. To get around this difficulty and accomplish the desired result, apply a unidirectional Galvanic Surging Current of about twenty impulses per minute with the negative electrode at the wrist and the positive on the opposite side of the forearm. It will prove effective. Use sufficient strength of current to produce forcible contractions.

A patient will usually tolerate this mechanical manipulation better than the manual. The position of the electrodes may be varied with each succeeding treatment, as for instance by changing them on alternating applications, so that on one the wrist will receive the palmar impulse and on the other the dorsal impulse. Daily treatments are advised, with strength of current to the patient's toleration. (See Figure 44.)

CHAPTER XX

AFFECTIONS OF THE FEET AND ANKLES

THE necessity of keeping the feet and ankles in a condition of perfect function is of so much consequence to the patient that the general practitioner of medicine, in order to save the expense of consulting a foot specialist, often advises the use of arch supporters and attempts to give advice about the shape of shoe which would give the most comfort. The importance of treatment that is more definitely scientific has provided a wonderful opportunity among medical specialists and practitioners known as "podiatrists," who are in a position to do much for the lasting relief of this class of sufferers.

If a weak foot is permitted to exist without proper protection, the unnatural strain due to the abduction and eversion, together with the lack of normal functioning, tends to increase the weakness. In this condition of the foot, all movements at the mediotarsal joint and at the subastragaloid become very painful. To avoid this, muscular spasm develops, first marked in the peroneals, in an effort at immobilization. Further use of the foot, without treatment, is usually accompanied by increased muscular spasm, resulting in rigidity and followed by a lowering of the dome, by bony changes, and by flat-foot as a final result.

Flat-foot may be described as exhibiting four degrees of deformity; namely, the oncoming, the more complete, the rigid and the osseous. The rigid and osseous forms are necessarily cared for by supports, splints, and often-

times surgery followed by the support treatment for a certain length of time.

Stern and Adams describe three forms of flat-foot, one in which the "rigid foot" is held by structural changes in the position of deformity. Another one is "flexible flat-foot," in which the arch can be restored by gentle manipulation. In addition to these, an intermediate type is sometimes seen in which the peroneal spasm is so great that the foot is held abducted and everted as long as the spasm lasts ("spastic flat-foot").

However, there are numerous varieties of incomplete flattening of the dome of the foot, due to weakness of the supporting muscles and ligaments. These come under the head of subjects for low volt current treatment, and in the hands of one who is familiar with the anatomy of the foot, and recognizes the cause of the distorted function, can be definitely relieved.

Whatever has been said about the application of galvanism and the Sine Current to local paralyzed muscles applies equally well to the atonic muscular and ligamentous areas that enter into the formation of the ankle and foot structure.

Figure 45 shows how an electrode should be placed in the arch and on the upper insertion of the muscle and nerve governing that area. Eight to ten milliamperes of galvanism should be used with the negative pole in contact with the foot and ankle, as shown, or in water, as shown in Figure 40. Unless an active inflammatory process is in evidence, either the unidirectional Galvanic surge or the rapidly Alternating Current surge may follow the Galvanic application to advantage, because of its exercise effect.

Any application of electricity as suggested is for the restoration of nutrition and muscular tone to the weakened nerves and muscles and should not be expected to

take the place of supportive measures when they are needed, but rather to hasten the time when such appliances may be discarded. Therefore, such measures should be considered as adjunct to other restoration processes, and used accordingly.

The position of electrodes on the foot, when used for the correction and relief of painful symptoms, must be in accord with the local disturbances in the foot itself. It is here that the water-bath treatment, as illustrated in Figure 40, is at times desirable. At present, many foot specialists are using Galvanic and Sine Wave Currents instead of the older and more primitive method of hand massage, and find their use far more efficacious and less arduous. A fifteen to twenty-minute application would be better than a longer one, as local muscular exhaustion might follow.

Painful conditions that apply especially to the feet and ankles may be of a traumatic or an infectious nature. Where the pain and possibly a muscular inability are manifestly local symptoms, but where the elbows, hands and spine exhibit marked symptoms of arthritis, it is logical to conclude that the painful conditions in the feet are likewise of an arthritic nature. If so, the source of infection, whether teeth, tonsils or colon, should first be determined and treatment given accordingly. However, if traumatism is evident, or there is a history of injury, either from ill-fitting shoes or a vocation calling for undue foot exertion, the treatment must necessarily include the regulation of shoes, or possibly the use of splints, surgery and rest, in order to effect a cure.

One has but to observe the course and attachments of the sartorios muscle to see that it has an intimate relation with the muscles below the knee, which directly and indirectly have a bearing upon the movements and functional activity of the feet and ankles. It may seem

far-fetched but it has proved to be reasonable to assume that intestinal toxemia, perhaps more especially in the sigmoid, has a direct relationship to the impairment of muscular ability in the feet, because of infection transmitted to the sartorius muscle and its associates.

Podiatrists have frequently referred their flat-foot cases to the author for a radiograph of the colon, especially when they thought they recognized the possibility of an existing intestinal stasis and a connection between it and the painful symptoms and weakness appearing in the feet and ankles.

The result has been that in many instances the impaired function of the feet and ankles, which was probably of an arthritic nature, responded to intestinal applications and improved to the same degree that the intestinal stasis and constipation were relieved.

Whether of traumatic or infectious origin, while the cause is being removed so far as possible, much may be done by physical measures for the patient's comfort and as an aid to quicker restoration of function. If there is a synovitis of the ankle joints, evidenced by bulging and tenderness on the front of the ankle and on each side of the tendon Achilles, galvanism, as applied for synovitis of the knee joint, Figure 48, would aid materially in hastening absorption of the inflammatory product.

In other words, whenever manual massage of the ankle and various areas of the foot is indicated, galvanism and sine wave therapy are applicable. The author has consulted podiatrists and orthopedic surgeons, whose experience with physical therapeutics coincides with the foregoing statement, and has found them very enthusiastic about the help which such measures have afforded them, in treating these cases.

The correct placing of electrodes and general technique depends on the peculiarities of each case. In some

instances, the use of a fairly sizeable electrode, placed on the inner side of the arch, with the other at the upper insertion of the leg muscle, is in order. In others, the foot may be treated by having it placed in water or medicated solution, as shown in Figure 40.

The following are a few of the many ways in which physical treatment may be applied about the feet and ankles. Even a casual review will tend to show how important it is that the current should be applied to certain individual muscles and nerves, and it is obvious that unless electrodes are properly placed, the looked-for results are likely to be nil. For instance, isolated action of the tibialis anterior causes lifting of the fore part of the foot, the motion taking place in both the ankle and tarsal joints. At the same time, the inner side of the main arch of the foot is straightened out, the sole is turned inward, the last joint of the great toe is flexed or depressed, because the lifting of the foot puts extra tension on the flexor muscles beneath the foot.

The peroneus longus is a muscle that is extremely important in maintaining the position of the inner arch of the foot and to prevent it from spreading. The action of the peroneus longus is to depress the great toe and draw it outward, which increases the curvature of the principal arch of the foot on the inner side.

The gastrocnemius, soleus and peroneus longus work together in all bodily exercises in which the weight is borne by the feet, and their combined action is necessary to the normal working of the foot. The loss of the triceps of the leg causes inability to extend the ankle and the loss of the peroneus longus causes a flat-foot. The tibialis posterior is another important muscle, the action of which is to pull directly backward on the scaphoid and cuneiform bones.

The importance of placing the electrodes at either end

of the impaired muscle and definitely on the impaired area, whether Galvanic or Sine Current is to be used, applies equally to any of the flexors, extensors or rotators of the ankle or foot, as would apply to Figure 41. One can readily see that if an application of galvanism was made with the negative pole on the inner arch of the foot and the positive pole on the upper insertion of the muscle, a positive restoration of tone would be invited. The Wave Current can be used in addition to the Galvanic if it is deemed advisable.

It is of course understood that no one should attempt to treat any of the important muscles about the feet without first knowing the special office and nerve supply of each. After determining this and studying the kind and amount of current applicable, little further can be added to the instructions except to recommend a careful scrutiny of the muscle chart and motor points (nerve exits) governing each individual area and the use of judgment and initiative in applying the indicated therapeutics.

CHAPTER XXI

PARALYSES

CONDITIONS are frequently encountered, such as paralysis following cerebral hemorrhage and some cases of arterial sclerosis, wherein the extremities are more or less functionally impaired by reason of enfeebled circulation. In such cases, negative galvanism to the ankle (see Figure 33) or with the foot placed in water, as shown in Figure 40, is a rational technique.

Where further treatment is desirable by the use of the Sine Current, it is advisable to change the position of the ankle electrode to the opposite side, as shown in Figure 41 A. This is explained by the fact that, when negative galvanism has been used for a sufficient length of time, the skin becomes sensitive and a Sine Current immediately applied to that particular spot would produce an unpleasant burning sensation. Changing the position of the electrode, as suggested, will avoid this discomfort, while in no way lessening one's ability to accomplish the object in view.

Fifteen milliamperes is a reasonable current strength for the average case. In elderly subjects, care must be used not to increase the current at the patient's suggestion because they "do not feel it very much." It must always be kept in mind that with galvanism, mild currents improve and strong currents depress vitality.

As a general thing, in cases of muscular atrophy, such as paralysis following cerebral hemorrhage, infantile paralysis, or when caused by local injury to a nerve supply, unless the nerve or nerve supply is actually de-

stroyed, the negative pole should be applied at the point of injury. The positive electrode should contact the other extremity of the muscle in question, as shown in Figure 41, and a waveless Galvanic Current of from five to fifteen milliamperes for five minutes should be used, followed by a Unidirectional Surging Current for five minutes more. The rapidity of the surge should always be governed by the normal movement of that part of the body under treatment. Here is where a too-prolonged surging treatment might do harm by overstimulating and exhausting the muscle fibre, and this must be carefully avoided.

A very common sequence of infantile paralysis and cerebral hemorrhage is a spastic condition that develops in the hand and foot on the affected side. This must be combated by instituting stimulation over the local nerve area of the opposing muscles. The tibialis anticus in the leg and the extensors in the forearm are the muscles that usually need special attention. The Galvanic Unidirectional Wave Current, with the negative pole at the extremities, seems to most successfully meet the indication. A current of sufficient strength to produce a firm contraction should be used, but only for a short duration — not over five minutes for each treatment — on account of possible exhaustion. (See Figure 49.)

INFANTILE PARALYSIS

After the acute stage of this disease has been passed, the indications are to relieve the pressure on the embedded nerve cells at the spinal nerve exits, so that the muscular tissue involved can once more function. It should be remembered, however, that ultimate recovery, either complete or in part, depends on whether or not the nerve cells governing the muscles under treatment are wholly or partially destroyed. Consequently, successful

therapeutics must rely on some process which has a solvent action on the hyperplastic accumulations in the connecting tissue, causing pressure and consequent dysfunction.

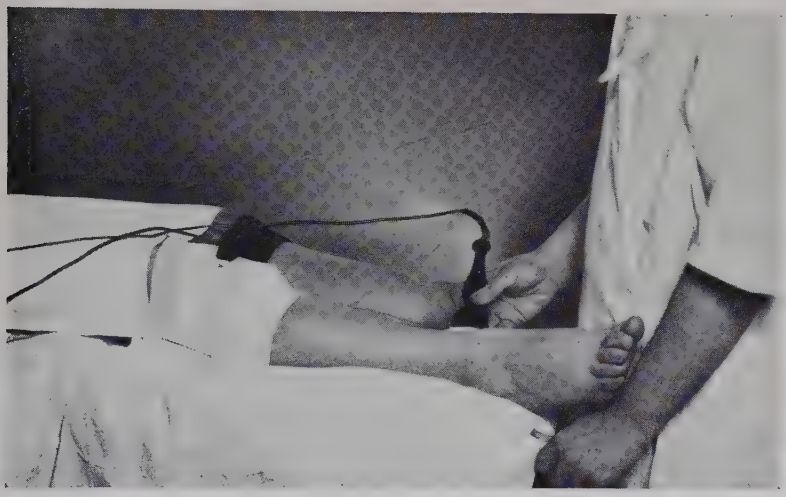

FIGURE 49

For treating this condition, the negative pole of the Galvanic Current is the most dependable agent. Its use may not be entirely successful but that can be readily understood when it is realized that certain cells may be actually destroyed and incapable of recovery. However, those that can be salvaged may still be capable of making the impaired arm or leg useful. While it is vitally important to attempt treatment as early as seems practical, and especially before complete inertia of the muscle and neuron takes place, surprising results are often obtained, even after three to five years of apparent inertia.

Figure 30 shows a spinal electrode attached to the

positive galvanic pole. In these cases, however, the positive pole should be applied to the extreme finger tips, or on a lower attachment of the muscles involved in the forearm. This technique can be supplemented by the use of the Sine (unidirectional) Galvanic Surging Current, selecting a motion in keeping with what may be considered normal movement of the muscle. A current of five to eight milliamperes for a period of not over ten minutes is ample.

To refrain from overstimulating the muscle at first is desirable, as it might cause temporary exhaustion and thus injure the patient's chance to derive the maximum benefit. Obviously, as the parts recover tone, the invigorating and stimulating treatment may be gradually increased in strength and prolonged. Yet it is always inadvisable to radically increase the strength of the galvanism on the general principle that "mild currents improve and strong currents depress vitality."

PARALYSIS (LOCAL)

When paralysis of the arm is in evidence, first determine what particular nerve or muscle is involved. (See chapter on Electrodiagnosis.) Then it would be good technique to place the positive electrode on the spine, upper dorsal region, and the negative on the arm at the point of the lower insertion of the debilitated muscle. Galvanism five to ten milliamperes should be used for a few minutes preceding the application of a Surging (Alternating Sinusoidal) Current, using about twenty-five impulses per minute. The strength of the contractions produced must be determined partly by the patient's comfort and partly by placing the hand on the parts where the impulse is desired. The operator can best gain a knowledge of the impulse produced by firmly grasping the muscle between the electrodes.

INCONTINENCE OF URINE

In children, the application of a current sufficiently strong to produce results is impractical because of their lack of toleration. In adult females, following childbirth, and also following some types of gynecological surgery where there is an atony of the sphincter muscle, the Galvanic Waveless Current and the Galvanic Unidirectional Surging Current will often produce the desired results. (See Figure 80.) In such cases, a carbon ball electrode, covered with moist absorbent cotton, should be placed against the urethra and a moist surface electrode on the abdomen.

In the case of elderly men who have had a prostatic operation, or who develop bladder atony because of overdistention, unfavorable conditions can be greatly helped by using a positive carbon ball electrode, covered with moist absorbent cotton, within the rectum and an external moist surface electrode on the lower abdomen. Use a smooth Surging Galvanic Current, to the point of toleration, and to insure results, applications should be made frequently and persistently.

FACIAL PARALYSIS (BELL'S PALSY)

In treating facial paralysis with the Galvanic Current — and this applies equally to all forms of paralysis — it is strongly emphasized that the zeal of the operator should not tempt him to give too lengthy or too strong applications. Such a course is almost sure to exhaust the muscles and thus hinder restoration. When practicable, short daily treatments can be used to good advantage, but when they are given only two or three times a week, the time should be slightly lengthened. The operator must remember that a paralyzed nerve is slow in response to sensation as well as motion, and the milliamperemeter should be his guide rather than the pa-

tient's sense of feeling. By not observing this precaution, temporary harm may frequently be done, and even final restoration of the debilitated part prevented.

FIGURE 50

The proper technique is to use negative galvanism on the affected parts, as in treating facial neuritis. (See Figure 28.) Three to eight milliamperes, according to the tolerance of the patient, for about five minutes, is sufficient. Another wise precaution which the picture brings out is to have the electrode extend low on the face, in order to embrace all the branches of the trifacial nerve. Following the application of the smooth Galvanic Current, as above directed, with the electrode still in position, the Unidirectional Wave Current should be used to the extent of inducing pronounced contractions for from three to five minutes.

If for any reason it is impractical to bind the electrode, as was done in the illustration, and it is necessary for the patient to hold it on the face, a comfortable, relaxed position should be adopted, similar to that shown by Figure 50. An electrode having a handle parallel to its surface instead of one at a right angle to it is often easier for the patient to hold without the arm becoming fatigued. Under those conditions, a more perfect and continuous contact is usually maintained.

CHAPTER XXII

OBESITY

MUCH has been written and many different devices have been invented for the reduction of body weight by physical methods. Some of these have been purely mechanical, developed in the form of oscillators or massage machines, in which a series of rollers were made to forcibly knead the obese portions of the body. Electricity also has been employed all the way from the use of long static sparks producing vigorous contractions, to the interrupted Galvanic Current for its "jerky" and less forcible impulses; and recently sine wave stimulation is also being used as equally efficacious and more agreeable.

Bergonie of France brought a method into prominence whereby a modified Faradic Current, producing rapid impulses in a rhythmical manner, was used and it was on account of that rhythm that a large amount of current could be used in a painless manner. Dr. J. H. Kellogg carried out the same principle in a similar manner, but substituted a Sinusoidal Current for the Faradic. More recently, the measured wave impulses of a rapidly Alternating Sine Current have been used by some operators because the application was thus made more agreeable to the patient.

The principle of all of these methods, it can be seen, is the same; namely, a well-defined attempt to change fat to muscle by exercise which in itself would not be harmful.

In carrying out any of these procedures, owing to the tediousness of treating patients who are very obese and present a large area to be covered, several moist electrodes of various sizes can be used at one time by the use of bifurcated cords. The breasts of women, however, also areas where deep-seated inflammatory processes may exist such as ovarian cysts, salpingitis, duodenal ulcers, likewise any abdominal malignancy, should be avoided.

This technique moreover should be applied only on the parts where adipose tissue is present in the largest quantities, and to insure best results, applications should be made four or five times weekly.

Any of these suggestions for treatment will of course be worse than useless unless a properly regulated diet is prescribed, and other safeguards taken against accumulation of additional fat. It is generally understood however that a rigid antifat diet, without sufficient exercise of the part or parts, may cause the patient to have an appearance of flabbiness about the neck and face. This naturally is undesirable for women who wish to preserve their youthful appearance. On the other hand, if the mechanical and electrical stimulation is depended upon solely for the removal of superfluous fat, and the diet is ignored, the condition will surely return.

If a proper diet and the mechanical methods suggested are carried out in conjunction and strictly adhered to, the looked-for results are always possible to a certain degree.

CHAPTER XXIII

ULCERS

FOR slow-healing ulcers, especially of the varicose variety and in elderly subjects, the frequent application of galvanism above and below the ulcer, as shown in Figure 5, will, because of its nutritional effect, induce more rapid healing. The author has observed this result a great many times.

Any ulcerated surface that remains "indolent" and fails to respond to the usual stimulating topical applications, such as zinc, copper, silver, mercury, etc., in the form of ointments, will often respond in a satisfactory manner to the proper medication applied in a watery solution in a cataphoric manner. This procedure tends to produce healthy granulations more rapidly.

Ulcerations of the sigmoid, when they can be located by the sigmoidoscope, can often be benefited by the application of soluble iodine (two per cent), Neo-silvol or the preparation Collosol argentum, applied on a gold, platinum or carbon-tipped electrode, covered with moist absorbent cotton. Iodine should be applied from the negative pole, and silver preparations from the positive pole, using five to ten milliamperes, with the indifferent electrode placed on the back or abdomen.

Ulcers of a non-specific variety above the vulva or in the vagina usually respond very readily to the same procedure as outlined above.

Some forty years ago it was a common practice at the Massachusetts General Hospital to treat varicose and eczematous ulcers on the leg, especially among the older

and more poorly nourished subjects, by applying a small disc of copper to the upper side of the ulcer and a similar disc of zinc just below it, connecting the two with a piece of wire. By moistening the metals occasionally this appliance created a local galvanic battery.

The underlying principle of this older method of treatment was fundamentally the same as that now used with more modern galvanic technique. It is not mentioned as being especially advisable, as careless persons attempting to continue treatment at home might produce a burn, and thus develop another ulcer. It is mentioned rather to show that the principle of improving local nutrition while not new has been wonderfully improved and can now be applied to many abnormal conditions of the body, ulcers or otherwise.

Much might be written along this same line, and the illustrations would apply equally well to many other similar conditions where galvanism can be made to assist in a deeper penetration of the drug indicated for the case in hand.

CHAPTER XXIV

POSTOPERATIVE SURGICAL AREAS

IT is generally understood that abdominal supporters, appendicitis pads, splints, adhesive plaster and other appliances whereby muscles are restricted in their action, because of surgery or inflammation, should be removed as soon as possible to prevent undue softening of the tissues or atrophy, and adhesions about the joints.

Following surgery in various parts of the body, and perhaps more especially in the abdomen, there is necessarily a certain amount of impairment of muscle and neuron energy due to the surgery itself, as well as that which was caused by the original disease or injury. It is here that both galvanism and diathermy are a valuable help to restoring muscular ability and nerve function.

Many users of physical measures, however, have become so familiar with the use of diathermy that they use it almost exclusively for such conditions and overlook the other method. This is lamentable, inasmuch as galvanism has the advantage of localizing the nutritional effect at the negative pole better than diathermy. Its action can be applied over a larger area and with obviously beneficial results, as is illustrated in Figure 46. Either galvanism or diathermy may be followed by the Sinusoidal and Unidirectional Surging or the rapidly Alternating Surging Current, as the case demands. This will still further add to the restorative action and abbreviate the period of convalescence.

When galvanism, because of its general nutritional effect, is to be applied to the extremities, it is advisable, unless some special localized area is to be benefited, to place the positive electrode over the spinal nerve exit of the part under treatment. The negative pole should be placed on the wrist or ankle, as shown in Figures 31 and 33, or applied with the hand or foot immersed in water, as shown in Figures 39 and 40.

Figure 44 shows the position of electrodes for galvanism or Sine Current applications following Colle's fracture. A great many conditions where this technique is applicable exist in different parts of the body. The kind of current to be used, also the duration and frequency of application, however, must be governed by the demands of individual cases.

CHAPTER XXV

INTESTINAL STASIS

CHRONIC intestinal stasis is a condition exhibiting so many symptoms that it is commonly admitted among authorities that at least eighty per cent of human ailments are directly or indirectly traceable to toxemia resulting therefrom; and usually the colon is the offending portion.

Acute gastrointestinal infections usually succumb to medicinal treatment after a few hours or a few days of illness and leave no serious effects. However, if there are repeated attacks, extending over a long period, sometimes years, then a condition not of temporary functional inability, but one of definitely impaired function should be recognized.

The marvelous progress made by surgery, due to a better understanding of the origin of sepsis, disseminated from toxic areas within the body, has permitted diseased and impaired functional conditions about the teeth, tonsils and colon to be recognized to a greater extent than ever before and their importance accepted. It is gratifying, however, to see that within the last decade, a better knowledge of the true function of the colon is being brought about. Noted physiologists, among them Alvarez, Cannon, Rabischow and others, have made the subject more understandable and from their writings one can easily see that the colon, and especially the region of the cecum, has been given special attention.

Dr. Gant, of New York, a proctologist of international reputation, several years ago wrote a volume on

diseases of the rectum and anus which has been considered a standard work on the subject, and, being a surgeon, his teachings were naturally along that line. This book consisted of five hundred pages in which only one short chapter was devoted to the colon itself, as participating in the conditions which he had under consideration (sigmoid and rectum). In his more recent publication of three volumes containing fifteen hundred pages on the same subject, nearly five hundred pages were devoted to morbid conditions about the colon. Such teaching, coming from authoritative sources, is significant when we consider the future health of our patients.

Where drugs and surgery have been so futile in our efforts to eliminate infection and restore function, and physiotherapy has proved itself so successful, it seems excusable that so much be said on the subject of intestinal toxemia. The importance which a better understanding of the technique involves cannot be too greatly stressed.

Any distortion in the natural curve of the digestive tract as a whole tends to increase friction and retard the normal passage of its content. Continued gastrointestinal dysfunction very commonly leads to distortion of this character and colonic dysfunction is frequently, if not commonly, the result. In other words, gastroptosis develops and a certain few, if not all, of the colonic sacs are mechanically transformed into retentive toxic areas. When this condition is encountered, physical methods of treatment are definitely indicated.

In the treatment outlined for the numerous phases of intestinal stasis, the author, while having profound respect for the importance of the nerve supply of the various parts, has endeavored to stress the efficacy of transmitting the electric current, or in other words the mechanical impulse, directly through the debilitated muscles. The clinical results obtained during the many

years in which he has consistently applied this theory seem fully to justify his reliance on it.

At the same time, Dr. Ireland, a widely known teacher of physical therapeutics, professes a firm belief that equally satisfactory if not better invigoration of the viscera can be obtained by applying the electric current through the spinal reflexes. His contention, like that of the author, is doubtless founded on a similar experience and amply justified by gratifying results.

There should be no controversy on this point, for if either or both of us have added something which will not only simplify but improve the older technical methods, it should be welcomed by every physician who is earnestly seeking a broader knowledge of the subject.

DIAGNOSIS WITHOUT X-RAY

When a physician cannot readily avail himself of an efficient X-ray operator, there are certain fairly reliable diagnostic points which, along with the history of the case, form a reasonably sure basis on which diagnosis of the cecum and sigmoid distortion and infection can be safely made. Of course, the acuteness of the angles at the hepatic and splenic flexures and the shape of the traplike conditions so often occurring where the cecum is much elongated, and in ileal stasis, can only be determined by a radiograph of the colon by barium enema.

When a patient lies on his back, completely relaxed, with the abdomen exposed, certain areas of infection and transmitting nerve tenderness can be located by palpation and percussion. For instance, percussion over the ascending colon may elicit a well-recognized tympanites, as compared with a dullness over the splenic flexure and descending colon. There is usually a tenderness on pressure (more pronounced if the patient will exhale with knees flexed) over the hepatic flexure or, to be more

definite, one or two inches below, in the average case. The intensity of this on the right side of the spine at the nerve exit in the lower dorsal region is sometimes very pronounced, and is usually a safe guide to the chronicity of the cecum infection. At the left nerve exit from the sixth dorsal region, which is the nerve supply to the stomach, a similar and usually very sensitive area will be found. When the case is one of sigmoid elongation and distortion, by having the patient flex the left leg and exhale (providing the subject is not too obese), pressure within the crest of the ilium will show a tenderness. In addition, it will often be noticed that the left sartorius muscle is extremely sensitive as a whole or for a part of its length. This condition also applies to tenderness of the outer sciatic nerve.

That the above diagnostic technique alone is far inferior to a radiograph of the colon is strongly emphasized, but circumstances sometimes make it necessary. However, it is suggested that even when an X-ray is taken the above procedure will help to verify its findings. Thorough diagnosis is very essential to the proper treatment of even what may be easily recognized as a local area of colon toxemia, especially where a threatened kink must be changed to a curve to prevent or defer disaster. This applies equally to what is so often carelessly spoken of as "constipation" and treated without due regard for the distortion which is really the source from which it emanates.

To make a satisfactory diagnosis of a chronic intestinal toxemia requires some method by which the shape and apparent condition (healthy or otherwise) of the colon itself can be determined. In the majority of cases, a radiograph of the colon by barium enema will supply all that is essential to determining the toxic areas.

The terms "Constipation," "Gastroptosis," "Gastroenteroptosis," "Fallen stomach," "Intestinal autointoxication," "Visceroptosis," and "Intestinal indigestion" are terms that convey a meaning but poorly. They are not exactly descriptive of the true condition with which the physician has to deal. To be more explicit, the author's daily observation of colonic radiographs has shown convincingly that if one is to work intelligently, he must definitely locate the area or areas causing the symptom (faulty elimination), unless failure, or, at the best, partial results are to be expected. To be sure, after following a certain definite line of procedure in applying physical methods, especially if it is based on long experience with many intestinal cases, one may come to consider past experience a guide of sufficient importance to warrant repetition. However, in elderly subjects especially, where a long-standing colonic angulation may be a possible incipient cancer, all precautions must be observed lest the patient's condition and the physician's reputation suffer. Hence, as is here and elsewhere stressed, a well-defined radiograph of the colon is extremely important.

While no one questions the value of an X-ray of the stomach and duodenum in determining its position, the presence of a possible ulcer, and other features, it is equally important to have an X-ray of the colon by barium enema, as just mentioned. The rapidly increasing number of physicians who depend on the X-ray to verify diagnosis makes it evident that those who are not especially conversant with X-ray interpretation should familiarize themselves with the subject, and use their own interpretation as a guide for treatment, rather than depend wholly upon the X-ray operator, no matter how experienced he may be.

It is the acute angles caused by abnormal elongation

of certain portions of the colon and consequent sacculated areas, which invariably become toxic and occasionally malignant. In elderly subjects, it is extremely important to ascertain the exact condition, due to the danger of treating ulcerative or malignant areas in a forcible manner and causing pain and possible hemorrhage. This would very likely occur if such an area were treated by the Surging Sine Wave Current in the same manner as it should be used for simple constipation.

In addition to this, actual harm might ensue; as, for instance, an existing salpingitis or a pelvic or visceral adhesion, although dormant for a long time, with no apparent disturbance, could be roused into an acute inflammation, precipitating the need of surgery. Here again is where the operator would be severely and justly censured by the surgeon.

To determine the force and vigor of intestinal peristalsis, one who is familiar with the interpretation of a radiograph by barium enema can, by the character of the lumen, easily recognize the areas where peristalsis is feeble, absent, energetic or spastic. This is of much more consequence than to determine just how long the fecal mass takes in its passage. These atonic areas are indicated by the smoothness of that portion of the bowel in comparison to the corrugated appearance which indicates the more or less forcible contractions which occur when any foreign substance is introduced. (See Figures 63 and 64.)

In order to reach a conclusive diagnosis of any abnormal position of the viscera when a duodenal ulcer is in evidence or threatened, an X-ray by barium meal is absolutely essential before a physician is at all justified in proceeding with any form of treatment. The colon, however, is so frequently found to be the seat of ailments arising in the digestive tract, that an X-ray of that part

is equally important, but when an attempt is made to outline its position by a barium meal, the results are usually disappointing. In brief, the twenty-four-hour method of X-ray examination by barium meal rarely elicits any fact of consequence below the pyloric region, and that of minor importance, viz.: the time required for passage of barium through the alimentary tract.

COLON X-RAY INTERPRETATION

From a casual comparison of human faces, one sees a general outline common to all, but when careful inspection is made, it will always be noticed that no two people look alike. The colon likewise has a common anatomical resemblance especially when it is pronounced normal, but just as careful scrutiny of faces shows marked differences, an equally careful diagnosis of the colon frequently brings to light some abnormality of position and a consequent dysfunction that has to be dealt with.

To refresh one's memory as to the position of the normal viscera, Figures 51 and 52 are inserted. It is quite necessary to keep clearly in mind the normal shape, position and function of the organs in the pyloric region (seat of duodenal ulcer), the ileocecal valve, and the sigmoid, as compared with any distortion caused by muscular impairment. As a common thing, conditions wherein physical treatment is definitely indicated are the result of muscular impairment and the consequent abnormal position of the digestive organs.

Figure 51 is intended to illustrate as fully as possible the normal position of the entire digestive tract. A section of the transverse colon is removed to show a portion of jejunum, also the liver and gall bladder are hooked up to expose the duodenal region.

Figure 52 is an artist's conception of the viscera,

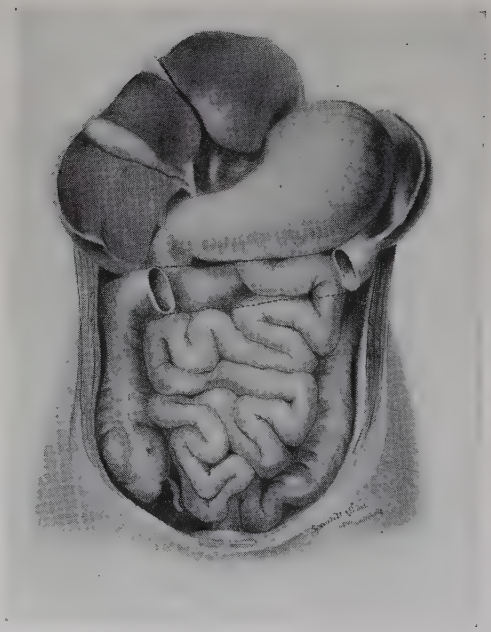

FIGURE 51

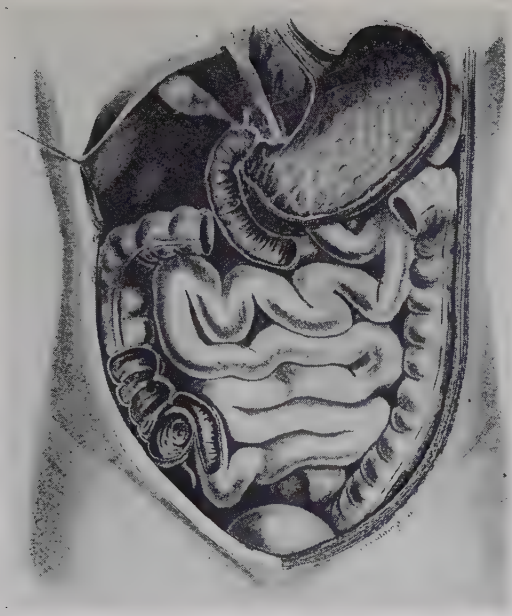

FIGURE 52

showing the stomach and duodenum with the inner surface exposed, as are also the cecum and ileocecal valve. As in Figure 51, a section of the transverse colon is removed. The object of these pictures is not only to refresh the reader's knowledge of this region but also to emphasize the desirability of giving the patient an opportunity to see for himself the difference between the normal position and that shown by an X-ray of his colon.

Figure 51 shows the relative position of the stomach and colon before ptosis has taken place. Every portion of the normal digestive tract is so shaped and arranged as to cause the minimum amount of friction in the passage of the stomach and bowel contents. All parts are rounding in their contour and any distortion of their natural shape sooner or later may lead to disease. In other words, an impaired physiology, if long continued, may become a pathology.

Figure 53 is a radiograph of the stomach, showing a prolapsus of sufficient importance to cause acute angulation at the duodenum. This shows the principal mechanical reason why duodenal ulcers occur at that point. Physical treatment tends to restore muscle tone to the stomach and duodenum, consequently lessening any impairment of the circulation, not only in the pyloric region, but in the whole digestive tract.

Figure 54 is a radiograph of the stomach made by the use of a barium meal and simultaneously that of the colon by barium enema. This picture clearly illustrates a mechanical displacement of the colon and indicates how a stomach displacement may in turn cause a colon distortion.

Figure 55 is a radiograph of the colon taken twenty-four hours after a barium meal, and is reproduced here mainly to show how unsatisfactory this method of di-

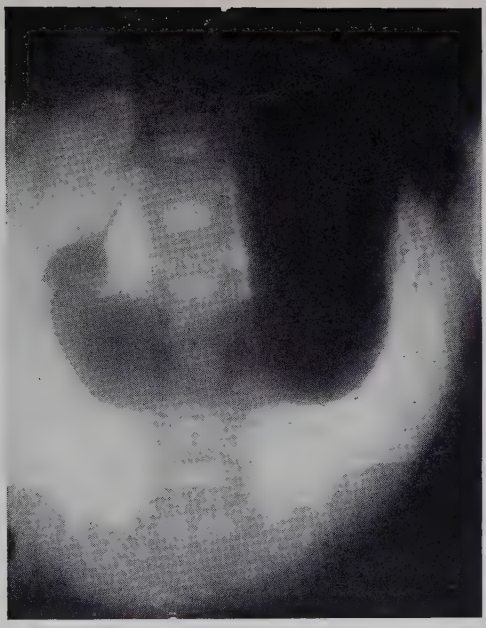

FIGURE 53

FIGURE 54

agnosis is, when compared with barium enema (see Figure 56), if and when intelligent treatment of colonic stasis is involved.

The following radiographs of the colon by barium enema are reproductions from the author's own private office files, selected at random. From these the reader will get a clearer idea of why the electrodes should be placed at definite points on the body.

Figures 57 and 58 indicate various abnormal positions which the colon frequently assumes, due to constipation or colitis. While applications of the Surging Sine Wave Current for treatment of such conditions is the accepted procedure, each case requires its own special technique.

In Figure 58 one can easily see a sharp angulation at the hepatic flexure with a marked distention of the cecum, also a prolapsus at the hepatic end of the colon extending to the crest of the ilium. In addition, it will be observed that certain areas of the colon have a fair peristalsis, as is indicated by the corrugated appearance. Other areas are smooth, indicating atony more or less marked. These conditions are a guide for treatment and for prognosis to satisfy the patient. It will be noticed in Figure 54, that while there is considerable distortion in both the hepatic and sigmoid regions, the apparent tonicity of the colon and the age of the patient (thirty-five years) indicate that in a reasonably short time, perhaps six to ten weeks, the existing constipation should be relieved. This is due to the ability of that kind of a colon to respond readily to wave stimulation through the hepatic and splenic flexures.

Figure 60 indicates a condition wherein the hepatic angulation is not very acute and does not show the appearance of a distended cecum. Consequently, there is no evidence of toxemia there, but the sigmoid is angulated

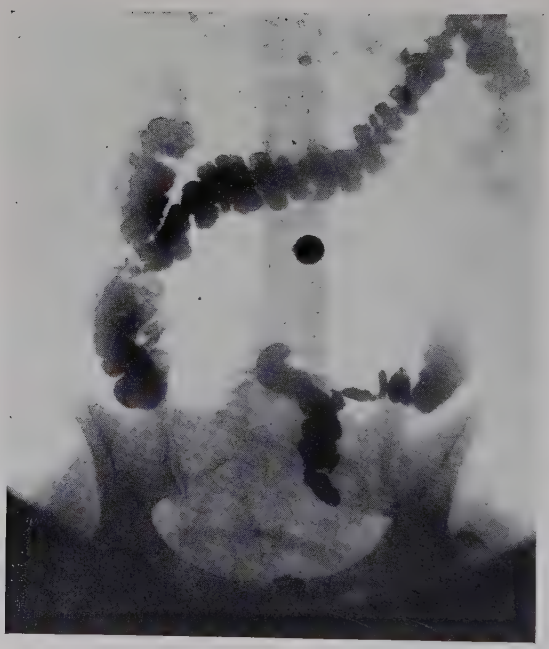

FIGURE 55

and distorted and shows an absence of good peristalsis. This is a well-marked indication for special attention to that region, as outlined in the treatment of sigmoid impactions.

Figure 60 shows almost equally acute angulations at both the hepatic and splenic flexures, with the colon prolapsed below the crest of the ilium. This indicates that the stomach has caused a central ptosis, unlike that in the previous illustration, which is more marked on the right side. In this case, the elongated sigmoid and the smoothness of the lumen of nearly all of the colon indicate what the older writers describe as atonic constipation. Treatment as outlined through the hepatic and splenic flexures and the rectum should be used in such cases two or three times weekly, and in all probability for about eight months. In this particular case, the patient was relieved of an obstinate constipation with abdominal gas, backache, etc., after six months of semiweekly treatments. The progress made by this patient is shown by Figure 59. As a usual thing, however, patients at the age of sixty having thin abdominal walls and poor expulsive ability, if they are to maintain a normal bowel function should return every few months for a few treatments, and, furthermore, should be told so, lest they get the impression that they are permanently "cured."

In Figure 57 is seen a sharp angulation at the hepatic flexure with distention of the cecum and a decidedly elongated sigmoid; also areas of apparent atony with some spastic appearance in the transverse colon. In this case, colitis was the prevailing symptom caused by marked constipation, due probably to cecum infection several years previous. These cases, regardless of the "diarrhea" of which the patient complains, should be treated through the cecum by wave current stimulation, in order to relieve the situation at the fountainhead of

FIGURE 56

the infection. This should be carried on regardless of the frequency of bowel movements, if the colitis has not advanced to a stage of ulcerative or membranous formation. As outlined under "Colitis," colonic irrigation and the application of "Neo-silvol" in solution on a carbon ball positive pole electrode inserted high within the sigmoid have the desired effect on small ulcers by ionization. Supplementing this, the constipation can be relieved by cecum stimulation.

Figure 61 plainly indicates incompetence of the ileocecal valve, as shown by the presence of barium within the ileum. Indications for treatment are the restoration of the valve's tonicity, which is best accomplished by using the Sine Wave Current faithfully two or three times a week for a considerable period. Even if the patient expresses himself as feeling much better of all symptoms, it is hardly safe to relinquish treatments until such action is justified by a second radiograph by enema. The author is very enthusiastic about this form of treatment for the condition outlined, and his X-ray files show that many incompetent ileocecal valves have been restored. Figure 62 shows result of sine wave treatments.

By observing the normal arrangement about the ileocecal valve, it is easy to see that distention, stretching or sagging of the parts would produce a condition of local inertia wherein attention must be centered on revitalizing the atonic tissue. Here is where heat or mechanical action, or the combined effect of the two, is indicated. Heat usually employed is diathermy and the desired mechanical action is provided by the Sine Wave Current. By their combined action the incompetent ileocecal valve can usually be made to regain its function.

Figure 63 represents another case of incompetent ileocecal valve complicated by a depressed condition at the hepatic flexure. Furthermore, there exists an elon-

FIGURE 57

gated sigmoid, and to a certain extent a traplike arrangement in the left iliac fossa. Such a patient, sixty-five years of age, had been taking cathartics more or less "since she could remember." No brilliant results could be expected, but treatments as outlined did much toward preventing further prolapse and deferred what seemed inevitable, viz.: malignancy. Figure 64 shows progress made by this patient and indicates that even under adverse conditions sine wave treatments are effective.

Whatever has been said about the treatment of intestinal stasis and specific applications over certain colonic angles, it should be understood, applies to the condition commonly called constipation. The apparent repetition in the foregoing instructions has been made because so many people thoughtlessly treat constipation in routine manner, without any special regard for the atonic angles of the colon.

Figure 58 shows a frequently encountered distortion of the normal anatomical position of the stomach and colon. Here the prolapsed stomach is producing an angle in the colon, at the hepatic flexure, sufficiently acute to cause distention of the cecum, retarding bowel content, and causing imperfect elimination. This is almost certain to be followed by a putrefactive bacterial process that may contribute to half a lifetime of discomfort.

Sooner or later secondary conditions, such as arthritis and infected tonsils, will follow, and if the primary cause is unrecognized or neglected, it may ultimately lead to malignancy. An elongated sigmoid is also a common result, and produces a traplike arrangement in the left iliac fossa, as is outlined. This, as is borne out by the author's many radiographs, is very commonly coexistent with a distended condition of the cecum. The technique for applying the Sine Wave Current to correct this condition is outlined in Figure 75.

FIGURE 58

FIGURE 59

FIGURE 60

A radiograph of the colon by barium enema, as shown in Figure 56, shows a sharp angulation at the hepatic flexure which evidently was brought about originally by the condition recognized as gastroptosis. The ptosis evidently is not central or at the left, but decidedly in the right iliac fossa, hence the marked depression at the hepatic end of the colon. This tends to block the bowel contents entering from the ileum, causing continued distention of the cecum and consequent infection until a series of disturbances arises all the way from the retention of gas and consequent pain in the right side to constipation. This is aggravated by the distended stomach above, and, frequently, by the constant use of drug cathartics, which not only fail to unload the cecum, but increase the watery elements of the intestinal tract, only to be followed by dryness. This usually leads to the use of more cathartics, and after months and oftentimes years of such procedure, the cecum becomes an area of putrefactive bacteria, which is the beginning of so many ailments due to septic dissemination from this point.

The cecum is so far from the mouth that little can be expected from medication, and so far from the rectum that, while colonic irrigations, implantations and other procedures if repeated times enough will do much toward alleviating symptoms, such as gas, pains, and even systemic infection, they will not change the mechanical misplacement. Surgery here is futile, and if attempted, usually harmful. Therefore, the one important therapeutic indication is that the kink, or threatened kink, at the hepatic flexure must be changed into something that approaches its original normal curve. So much may be done by electrical and mechanical means to improve local nutrition and restore muscle tone that, things being equal, it is without question advisable to make the effort. This is especially true in view of the success which

FIGURE 61

FIGURE 62

FIGURE 63

those who have had experience with physical methods are prepared to relate.

Figure 55 shows how imperfect a radiograph of the colon is for diagnostic purposes, if taken by the oral method after twenty-four hours. While admittedly this radiograph does show evidence of a prolapsed stomach the real object of referring to it here is to point out how defective the outline of the colon is, as compared with what is shown by Figures 56, 58, 59 and 60. These were taken by barium enema. It is the sacculated, elongated portions which contain toxemia, and their actual location must be predetermined in order to carry out any successful therapeutic procedure. The author wishes to stress the fact that conditions leading to constipation and its attendant symptoms cannot be intelligently diagnosed by a series of gastrointestinal pictures. This is frequently attempted, and the cuts in question are offered to illustrate the point.

When it seems important that the mechanical relationship existing between the stomach and colon be determined, a radiograph by enema should be taken first. Directly following this, one of the stomach by barium meal should be made, before allowing the patient to eliminate the barium; otherwise, a colon picture would be incomplete. On the other hand, if the stomach radiograph is attempted first and the usual time of preparing the patient for a colon X-ray elapses before that is taken, the picture may be obscured. This is especially noticeable if the stomach is at all active, because the duodenum and jejunum become filled and confuse the outline of the colon itself. Here is where a little careful technique is indispensable if a radiograph having outlines sufficiently well determined for intelligent diagnosis is to be produced.

The following radiographs of the colon (Figures 66 to

FIGURE 64

FIGURE 65

71) are further examples of the many cases that physicians are called on to treat in everyday practice. Such conditions are amenable to physical therapeutics to a degree parallel with the intelligent manner in which applications have been made, the course of treatments consistently followed and an appropriate diet strictly adhered to.

Figure 66 shows a typical example of a sharp angulation at the hepatic flexure, causing distention and consequent toxemia of the cecum; likewise impinging the appendix on the inner crest of the ilium. In this case appendectomy had been performed for the removal of the symptoms, but the cecum infection, constipation and pain returned after six months, because the acuteness of the angle at the hepatic flexure was not recognized as being the important contributory cause.

In this radiograph it will also be noticed that the sigmoid is much elongated. This distortion added still another retentive toxic area, and the existing myositis in different parts of the body was a natural sequence. An illustration of what may be accomplished by Sine Current stimulation, if carried on for a period of three months as outlined elsewhere for constipation, can be seen in Figure 67. This shows no great anatomical reposition of the parts, but it does show less acuteness at the hepatic flexure, increased motility throughout the whole colon, and a diminution of the distended sigmoid. In this case, the constipation was corrected so that cathartics were discontinued for the first time in many years, and arthritis resulting therefrom sufficiently relieved so that the patient no longer complained of "soreness" in the joints.

Figure 68 shows a well-marked case of hepatic flexure angulation and sigmoid distortion, which had been existing long enough to cause an incompetency of the ileocecal valve. This is shown by the presence of barium

FIGURE 66

FIGURE 67

FIGURE 68

in the ileum. Had this radiograph been taken by the oral method, the incompetent valve would not have been clearly defined, and the real guide for physical treatment would have remained unobserved. Such cases, because of prompt absorption by the ileum of the putrefactive bacteria from the cecum, are usually arthritic and constipation or alternate constipation and diarrhea are the prominent symptoms.

It can also be noticed that the cecum was considerably distended and in that connection physical examination and colonic irrigation proved that putrefactive bacteria had been present for a long time. The sigmoid furthermore was elongated and distorted, which condition added greatly to the imperfect elimination.

Figure 69 taken six months later shows the same patient with a marked improvement in the tone of the musculature of the colon as compared with the previous radiograph. It can also be noticed that the incompetent ileocecal valve has apparently been restored to normal action and it may be added that a relief of the constipation and arthritis was fully accomplished. This is a good illustration of the many cases presented to the physician in the course of his daily practice where drugs, surgery or a most careful diet alone can avail but little, but where it is possible for properly applied physical therapeutics to do much.

Figure 70 is a radiograph of the colon by barium enema which shows sharp angles at the hepatic and splenic flexures due to an existing gastroptosis, also a very marked elongation and dilatation of the sigmoid. This case was treated by the wave current methods described under the technique for sigmoid administration in similar cases.

Figure 71 is a radiograph of the same patient after six months of irregular treatments by wave current stimu-

FIGURE 69

FIGURE 70

FIGURE 71

lation. The previously existing arthritis, constipation and many of the so-called "nervous symptoms" had then disappeared and up to the present moment (a lapse of two years) have shown no recurrence.

The case just described was that of a woman aged forty, consequently equally brilliant results can hardly be expected in older subjects. However, the basic principle of all therapeutics is the same and if one can but approximate such a gratifying result he is fully justified in using every reasonable endeavor and should continue treatments to the point when he and not the patient considers the nearest approach to normalcy has been reached. Physicians should impress this on the patient and to make it convincing the use of these or any other similar pictures is recommended.

TECHNIQUE

When treating constipation, it is essential that the large electrode on the back should be placed high enough to correspond with the proper nerve and muscle supply, instead of in the lumbar region, because of its convenience. It is desirable with people who have hollow backs to place a small cushion against the electrode to insure proper contact. The strength of the Alternating Sinusoidal Current as shown by the sine wave indicator can be followed, but that is not so good a guide as the actual contractions produced. Those are essential to obtain results. (See Figure 72.)

The three pictures in this series (Figures 72 to 74) show the proper position of the electrodes when wave current stimulation from the alternating sinusoidal part of the apparatus is employed. A routine technique, which of course can be varied if indications require it, is to place the large electrode on the back and a smaller one over the hepatic flexure for ten minutes and then with

the large electrode undisturbed, place the smaller one over the descending colon.

In applying this current, the usual routine is first through the hepatic flexure, Figure 73, and then through the splenic flexure, Figure 74, and through the sigmoid, if it is involved. During treatments it will usually be observed that a greater current strength can be tolerated through the hepatic than through the splenic flexure.

FIGURE 72

This is explained by the fact that the cecum, in the average case, has been longer infected, causing a consequent diminished electrical response. The sigmoid electrode should be used as elsewhere described, and it will usually be observed that the desired contractions are slow in starting within the bowel. Sometimes one or two minutes elapse before a patient is conscious of any effect. This is partly due to the nature of the involuntary muscles under treatment, and partly because of the more or

FIGURE 73

FIGURE 74

less toxic condition existing in the area forming the circuit. However, unlike other portions of the body where voluntary muscle fibre is in circuit, the response to the impulses has the peculiarity of continuing for a considerable time after the treatment has ceased, thus enhancing the value of the method.

While it is practically a physical impossibility to cause an entirely normal reposition of the stomach, *per se*, by increasing the motility of the walls and surrounding tissue, it has been proved many times by comparing radiographic findings before and after treatment, that the acuteness of the angulation at the pylorus has been lessened and that the stomach is in a position to more quickly empty itself. Therefore, if this is true, low voltage applications lessen the liability of duodenal and gastric ulcers.

SIGMOID

When the case is diagnosed as one where sigmoid stasis is an important contributing factor, the sigmoid electrode (see Figure 74 A) should be used and the large indifferent electrode placed over the descending colon instead of on the back.

FIGURE 74 A
Sigmoid Electrode

During this treatment, the patient should be reclining on the left side, as indicated by Figure 75. For sigmoid applications, the contractions should be made sufficiently forcible to be felt within the bowel. This requires a little time, as the mucous membrane of the bowel is slow to respond to stimulation. The operator can ascertain when sufficient current is being used by

placing his hand on the external insulated portion of the sigmoid electrode, and feel the contractions as it is drawn within with every impulse. The best results are obtainable when the current strength is used to the point of toleration. Increasing the size of the electrode used on the abdomen, moreover, tends to proportionately diminish skin resistance, and thereby hasten the desired contraction. If, because of the susceptibility of the skin under the external electrode, more surface current is required, this may be supplied by placing an electrode on the back and connecting the two with a short wire, or by using a bifurcated conducting cord.

FIGURE 75

After the current strength has been properly adjusted, the application should last about ten minutes. This time, however, may be varied in accordance with the indications or the susceptibility of the patient to the necessary invigoration. When a patient can tolerate a current pro-

ducing vigorous contractions, a lesser time is needed than when the contractions are weaker. If the application is too prolonged, exhaustion rather than recuperation of the impaired muscles is liable to ensue. In the average case of constipation where sigmoid treatment is indicated, applications should occur about twice weekly and even more often unless the cecum is in a toxemic condition, where frequent stimulation might liberate toxins beyond the ability of the patient to eliminate.

The sigmoid electrode is inserted in the rectum at the proper height to reach the sigmoid and it is most important that it should be securely held in place throughout the whole application. This is requisite, because better results are obtained through positive contact with the debilitated musculature of the sigmoid itself. Furthermore, it obviates the possibility of the metal tip slipping back to the outer anal region and causing an uncomfortable burning sensation.

It is well known that when a current of electricity contacts any locality where skin and mucous membranes unite, as in the anus, a sensation of sudden burning or cutting is experienced. Therefore, this precaution should be taken, as any occurrence of that kind is unnecessary and could justly be attributed to carelessness.

From the illustration it will be observed that the external electrode is placed directly over the descending colon. The largest electrode is used in order to reduce skin resistance to a minimum and concentrate stronger impulses directly within the sigmoid region.

It will also be noticed from the illustration that this external electrode is held firmly in place by an elastic band with cloth terminals for convenient tying. Otherwise, the slightest movement of the patient's body might tend to disturb the completeness of the contact and unpleasant and unnecessary skin disturbance would

ensue. This method of holding the external electrode is preferable to the use of sandbags or cushions when the patient is required to lie on the side.

DIVERTICULITIS

Diverticulitis, which usually is easily outlined in a radiograph of the colon by barium enema, is a condition wherein any mechanical effect, like the Surging Current, should be used with caution. Figure 64 shows a well-marked case in the pelvic portion of the colon.

COLITIS

Colitis is usually spoken of as a "mucous colitis" or "chronic diarrhea." This paradox usually leads to a misconception, as the patient is suffering from chronic constipation, due to stagnant toxemia in the cecum and the action of the putrefactive bacteria passing from the hepatic flexure onward. This causes a condition which may be simply catarrhal, mucous, membranous, or ulcerative, and when sufficiently long continued, even malignant. The treatment, therefore, instead of carrying out the usual therapeutic measure of astringents, of which, perhaps, bismuth is the most common drug, should be directed toward the elimination of putrefactive bacteria in the cecum and the ascending colon. Until that is done, whatever relief may come from so-called intestinal antiseptics and astringents will only be temporary.

A method that has proved quite efficacious for its local effect is the application through the sigmoid of a two per cent solution of Burnham's soluble iodine on a carbon or gold-tipped electrode covered with absorbent cotton, using the negative pole attached to the internal electrode with the positive surface electrode over the splenic flexure. This process of ionization is not so dif-

ficult as it might seem, as the parts can be lubricated, as well as the iodine-cotton-covered carbon ball. This precaution allows the insertion to be made with less difficulty and with greater comfort for the patient. Use a current of from eight to twelve milliamperes for twenty minutes, unless it cannot be comfortably tolerated. The technique just outlined applies to the descending colon only, and the treatment as outlined elsewhere for mechanical surging should always accompany the procedure. Colonic irrigation can be used to advantage in conjunction with this treatment. After the catarrhal condition has ceased to exist, unless a diverticulitis is present, the surging treatment with sigmoid electrode can be used to restore the lost tone caused by the infectious process.

Figures 57, 63 and 65 indicate various abnormal positions which the colon assumes where constipation or colitis is the predominating symptom. While applications of the Alternating Sine Wave Current for treatment of such conditions is the accepted procedure, each case requires its own special technique.

The importance of having a radiograph by barium enema for accurate diagnosis has been stressed in the foregoing paragraphs; also its value as a guide to treatment, rather than attempting to depend upon a series of radiographs of the whole digestive tract.

One has only to compare the two methods in order to realize the importance of accurately ascertaining, not only the shape of the colon and the acuteness of the angles, but also the dimensions and special characteristics of the various saclike portions, which are the retentive toxic areas. It is to these that our therapeutics must be directed.

Restored function is usually recognized by the patient by a diminished amount of abdominal gas, elimination

of bowel contents without aid of cathartics, and relief from many other attendant symptoms. From the physician's standpoint, a radiograph of the colon, even where natural function has been restored, will rarely show any marked anatomical reposition in the affected areas, but will show increased volume of the musculature of the colon, and more or less changing of the acute to more obtuse angles at the hepatic and splenic flexures. This is a decided advance over results obtainable from drugs, mineral oils, "intestinal antiseptics," abdominal supporters, and other common routine methods.

It is an accepted fact that the care of defective teeth, infected sinuses, and the removal of tonsils have done much to relieve symptoms. However, if an infected cecum, with or without sigmoid complications, still exists, unfavorable symptoms are likely to recur in many forms, also kidney and arterial complications will doubtless present themselves earlier in life than they would had the colon received equal consideration.

In conclusion, surgery, to relieve the situation induced by an incompetent ileocecal valve, to correct a sharp angulation at the hepatic flexure, causing distention of the cecum, or to eliminate toxins in sigmoid elongation, is practically futile. Colonic irrigation has a promptly noticeable although temporary benefit, and consequently has a place in therapeutics. Implantations of the Bulgaris bacilli and acidophilus preparations to the putrefactive bacteria may give a certain amount of relief. However, unless the dangerous angles producing infectious retention are modified and the colon made to function more nearly as nature intended it should by resuming its natural muscular movements, any therapeutics are but feebly effectual.

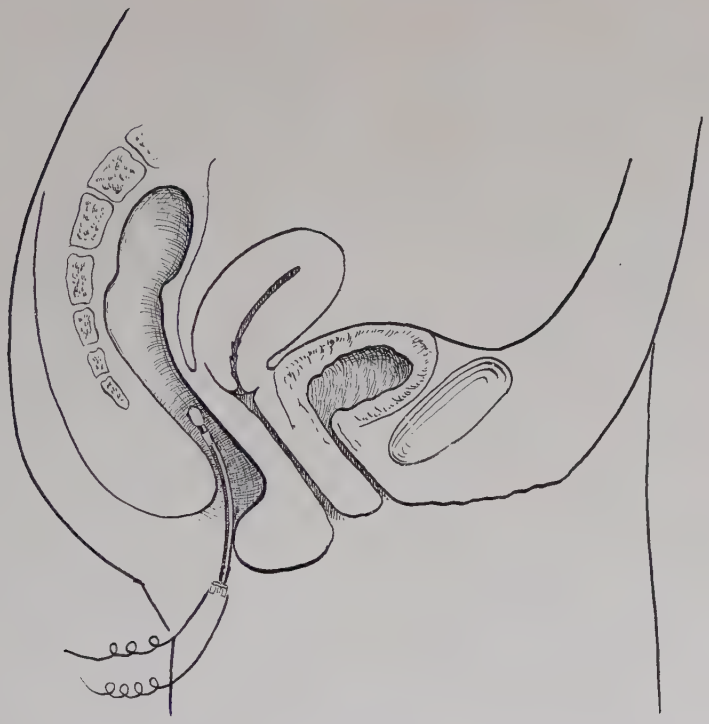

FIGURE 76

Figure 76 illustrates the method of applying a bipolar rectal electrode for the treatment of relaxed muscles, sometimes called prolapse. This electrode is shown by Figure 82.

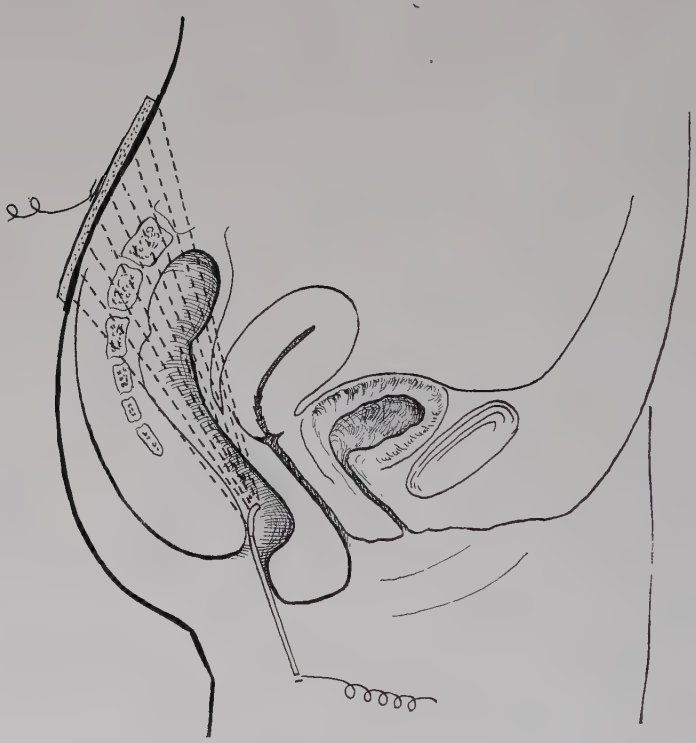

FIGURE 77

Figure 77 shows the proper position of the electrodes when applications are made for the purpose of ionization or stimulation through the rectum, when such procedure is indicated.

CHAPTER XXVI

HEMORRHOIDS

BLEEDING, internal hemorrhoids, ulcers about the rectum, and rectal prolapsus can be electrically treated for an astringent effect with copper, zinc, or any other form of medication desired. This can be carried out by inserting the electrode beyond the sphincter muscle, and placing the indifferent surface electrode on the abdomen. If metallic electrolysis is to be used, the internal electrode must be positive, and the strength of current to the point of easy toleration. There is no specified milliamperage because there is a certain amount of metallic oxidation to be carried out at the point of contact, for its local effect only. Therefore, either five milliamperes ten minutes, ten milliamperes five minutes, or a milder current for a longer time would be the proper technique.

When the positive electrode has been in place long enough to produce an astringent action plus the deposition of the metal, it often results in sticking to the part being treated. Under those conditions, do not attempt to remove it until the current has been slowly turned off, reversed, and the negative pole allowed to pass through the metallic tip with a mild current for a short time. The electrode will then become loosened and can be easily removed. If an attempt is made to remove it without taking this precaution, there is a possibility that the mucous membrane which has been in contact with the metallic portion of the electrode will be denuded and cause bleeding, followed by unnecessary local soreness.

For the treatment of colitis and ulcers within reach in the rectum, zinc may be used on a metal-tipped electrode, placing the positive pole internally and employing a mild Galvanic Current. If any of the iodine preparations are to be used, then the negative would be the internal or active electrode. The current should be weak, otherwise painful contractions may ensue. Any medication which might be applicable to the case can be rendered more potent and rapid in effect if used in this way, than by the usual topical action. Care must be exercised and the correct pole applied with the drug, after determining whether it be electropositive or electronegative.

A common practice, which can usually be made successfully, is the application of the Galvanic Current to hemorrhoids. The procedure consists of exposing the hemorrhoids so as to make clear the field of operation, and then inserting a zinc-tipped, insulated, needle-size electrode, attached to the positive pole. This produces zinc electrolysis. By using an insulated needle (the same zinc one described would do), and using the negative pole, it would produce an interstitial electrolysis. In either case, the hemorrhoid collapses or shrivels and becomes obliterated. Here is where the parts must be prepared by a hypodermic of some such local anesthesia as a solution of butyn, two per cent, novocaine, or quinine urea. Quinine urea is a favorite because it produces a prolonged local anesthesia.

CHAPTER XXVII

PROSTATITIS

THE non-surgical treatment of any abnormal condition of the prostate gland is something that must be observed from different angles before any physical method can be successfully attempted. While the causation of a chronically enlarged gland is usually of a specific nature, other conditions, such as too frequent hyperemia, may lead to congestion and stasis, and be followed by a chronic inflammation resulting in a condition of hypertrophy. As the patient grows older, this will continue to exist and be troublesome, mainly because of the size and consequent pressure which varies with shape and size. While the pressure may not be enough to impair function, it usually interferes with proper bladder elimination (oftentimes seriously). This in turn may lead to a chronic cystitis and eventually more serious consequences.

Prostatitis, where a continuous inflammation and tenderness exist with resulting enlargement due to the presence of specific germs, may have a still greater influence by causing serious consequences to surrounding tissues. Such a condition may not only cause arthritic conditions by aiding to disseminate infection from the intestines to the joints, but lead to worse conditions, such as a disease of the urethra, and by extending to the kidneys cause a form of nephritis liable to result in death.

In either acute or subacute forms, where there is tenderness or pressure with more or less local pain of a non-

specific character, positive galvanism is effective. A carbon ball covered with moist absorbent cotton applied directly against the prostate (the indifferent electrode being on the abdomen), and using a current of from five to ten milliamperes for fifteen minutes, will usually cause a subsidence of the local symptoms. This treatment should, of course, be used in conjunction with one designed to eliminate the disturbance which may have caused them.

When simple hypertrophy of a non-specific nature exists (the line should be sharply drawn), and in cases where massage has been a routine, if not the principal form of treatment, for a long time, the use of the Sine Current is recommended. This should be applied with a prostatic electrode (metal tipped) in conjunction with a large abdominal surface electrode. By using a surging form of current, varying from ten to twenty impulses per minute, it will usually reduce the hypertrophy and relieve the bladder pressure. Such a treatment is entirely in accordance with manual massage, but its effect can be made more pronounced, more definite, and more satisfactory to the patient.

The routine treatment with many physicians is to apply diathermy through the parts, followed immediately by the Surging Current, as described, taking care not to prolong these treatments beyond ten minutes.

Here, as in any simple hypertrophy, ionic medication may be used to good advantage. Iodine preparations, as for instance a two per cent solution of Burnham's soluble iodine, are a favorite formula with the author. A mixture of ichthyol, glycerine and iodine, of which there are some good proprietary preparations on the market, will be found useful. A carbon ball electrode covered with absorbent cotton saturated with one of these preparations should be used on the negative pole for the ionic

dispersion of the drug in and about the gland. The frequency of application should be about twice weekly at first, and as the bladder (pressure) symptoms subside, the time between applications can be lengthened.

Figure 75, showing the rectal electrode in place for the treatment of sigmoid impaction, or constipation, is a correct technique for prostatic application. The electrode, however, must be held firmly against the gland and, to insure this, a substantial and reliable rectal electrode supporter should be used.

CHAPTER XXVIII

COLONIC IRRIGATION

THE recent popularity and enthusiastic use of colonic irrigation, by a large number of physicians, is unquestionably justified, especially as the reason for this procedure is both valid and easily apparent. Many things must be taken into consideration, however, before one should make any attempt to disturb either the normal or abnormal secretions in the digestive tract, and that precaution applies equally well to the colon. In any event, an apparatus so arranged that the intake and outflow is regulated with the least possible disturbance or friction at the sphincters is highly desirable.

The manipulation of a long, rubber tube within a colon having an approximately normal shape, so far as its contour and diameter are concerned, is a simple problem as compared with the one encountered when attempting to carry out the same procedure in a colon that has abnormal kinks and sacculated portions.

The basic therapeutic indication for colonic irrigation is the retention of putrefactive bacteria, the location of which can usually be traced to the cecum, and that is the point of attack from which the greatest degree of relief can be accomplished. It naturally follows that any impactions in the pelvic colon or an existing colitis, either catarrhal or ulcerative, will be benefited by the procedure if the solutions and plan of medication are properly adapted to the case in hand.

Those who are familiar with colonic irrigation and have had the experience of actually doing the work or

having it done, in their office, by an experienced technician, will realize that from three to six irrigations are often necessary before the desired result can be accomplished, namely, the removal of detritus in the form of mucus, shreds of membrane and other indications that the septic point has been relieved. When this result is definitely and visibly assured, it is invariably corroborated by the patient's statement that he feels better, mentally and physically. While this is the usual experience, the result of the treatments will manifest itself in other ways, such as in the relief of arthritic areas, diminution of abdominal gas and relief of constipation, also many other indications of improved well-being.

There has been considerable diversity of opinion regarding the technique; that is to say, whether a large or small tube should be used. With a large tube, the possibility of deeper penetration, even extending to the cecum, is argued, thus producing a more complete flushing. With a smaller tube, producing a slower intake of the fluid, the inflation caused by it is expected to reach the cecum just the same.

Having an X-ray outfit always at hand, so that a frequent check not only of results but of the position of the tube could be made, the author's experience has led him to believe that the position and penetration of the tube itself has far less to do with the desired end than has been generally claimed.

While the rubber tube may have been inserted full length, it does not necessarily follow that the actual depth of its penetration is as great as appears. With the tube practically out of sight and a reasonably free passage of the fluid maintained, operators are easily deluded into thinking and claiming that the tube actually has reached the cecum. The X-ray, however, demonstrates that penetration to that depth can hardly be ex-

pected except through a colon that is closely normal in shape and irrigation not definitely indicated.

A distorted and elongated sigmoid usually forms a traplike arrangement. This impediment is determined by a radiograph by barium enema, which is the best guide for intelligent insertion of the colonic tube for irrigation purposes. It should be unnecessary to state that great care must be observed where the possibility of ulceration exists, but this can usually be determined by the patient's symptoms, and verified by the sigmoidoscope if necessary. Of course, the presence of malignancy absolutely prohibits the use of colonic irrigation.

Another and frequently unrecognized element of contraindication which can only be definitely determined by a radiograph of the colon by barium enema is the presence of an incompetent ileocecal valve. When this condition is present, if a large amount of fluid is forcibly injected into the cecum, it will tend to carry more or less putrefactive bacteria from it into the ileum. Here because of the natural ability of the ileum to absorb septic material, as well as nutrients, unpleasant and sometimes almost disastrous reactions are likely to occur. Several days may be required before the patient recovers from the general auto-intoxication thus produced; and incidentally it is often observed that an exacerbation of the symptoms peculiar to the case at hand will exist.

Enough has already been said to show that the author is firmly convinced of the value of intelligent colonic irrigation, and that he as heartily deplores its indiscriminate use. This applies not only to the class of cases selected for treatment but also to the methods of application adopted by those who have not been properly trained.

Colonic irrigation when properly administered with efficient apparatus is in itself a physical treatment of

FIGURE 78

sufficient importance to be recognized by every one, whether he ever used other physical methods or not. Not only is the method valuable for its antiseptic and cleansing properties, but by relieving the weight on the softened, infected and impaired musculature of the cecum, and elongated sigmoid, the debilitated portions are allowed to respond more readily to other methods.

As elsewhere stated and illustrated, the rapidly Alternating Sine Wave Current is becoming universally adopted as the treatment *par excellence* for gastrointestinal prolapse. Therefore, a combination of colonic irrigation and wave current therapy can be made productive of quicker and more lasting results than either one alone.

Figures 78 and 79 show two of several types of apparatus used for colonic irrigation. These are so arranged that a large central tank holding two or more gallons can be filled with plain water, or a weak saline solution, a combination of sodium bicarbonate and salt, or any other solution that the physician considers advisable. During the cleansing process, this tank may be filled from one to three times as is needed. The two smaller tanks are for the purpose of holding medicated solutions of a more concentrated form, for use after the cleansing process. This medication may consist of preparations containing weak iodine solutions, silver solutions (Neo-silvol), permanganate of potash, Collosol Kaolin, or any other substance effective in the treatment of sigmoid ulcers, catarrhal and membranous colitis, and the like.

Many operators are using this method for "implantation" of the acidophilus preparations. In addition to this, there are a number of other procedures which could be successfully adopted and combined with wave current applications and the simple colonic irrigation.

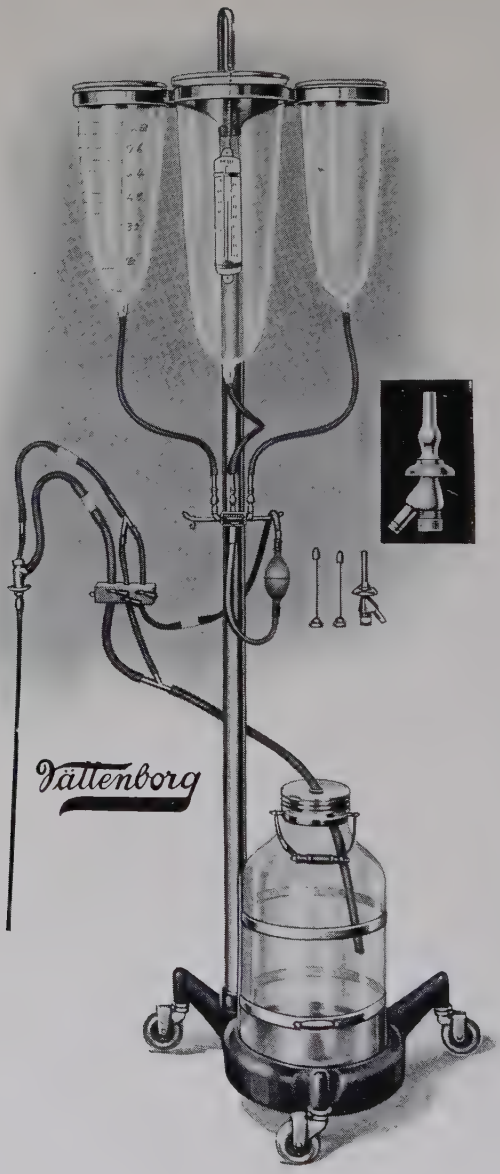

FIGURE 79

At the State Insane Asylum at Trenton, N. J., it has become a regular, established technique in cases of colonic infection (which condition is found in the majority of demented persons) to use colonic irrigation and Sine Wave Current stimulation through the hepatic flexure and within the sigmoid on alternating days. It is noticed that a relief of the mental symptoms almost invariably follows this procedure. The hospital annual report states that as a result, many who were supposedly committed for life are returned to their homes, symptomatically cured. Gratifying results of this nature are being accomplished by the same method in many other similar institutions throughout the country.

In private practice, where it is not easy for patients to come daily, a parallel technique is often carried out by using colonic irrigation followed immediately by wave current stimulation to the affected parts as just outlined. For treating the usual case of constipation (see Figures 73 and 74), this method is highly satisfactory and is the one usually followed by the author.

A not uncommon procedure, after the colon has been thoroughly irrigated, is to leave as much water in the bowel as can be comfortably retained, also the rubber tube. Then immerse one terminal from the sinusoidal apparatus in the solution tank and attach the other to the external moist electrode and proceed in the same manner so far as strength of current and rapidity of sine wave are concerned as one would in using a sigmoid electrode. (See Figure 74 A.)

It is a common practice in the writer's office to use for the first irrigation, in the average case, a solution of castile or tincture of green soap in place of the usual solution of salt and soda. The strength and amount to be used, however, should be determined by the apparent need, whenever this procedure is adopted.

To sum up the fundamental factors which govern the use of colonic irrigation as a safe and successful therapeutic measure, we must keep these points clearly in mind.

First we must ascertain if there is an honest reason for it, not depending upon the patient's statement as to what he would like, but deciding the question solely by the result of a careful examination. Where an ulcerative form of colitis or sigmoid malignancy is apparent, or other rectal condition such as bleeding hemorrhoids, fissure, or fistulas, steps should be taken to correct it before taking the chance of adding further irritation to an already irritated part. Also while even the possibility of an incompetent ileocecal valve exists, force either from water or tube should be avoided, as it would most certainly promote absorption of the cecum bacteria, which might thereby be forced back into the ileum. These conditions should be corrected before colonic irrigation can safely be administered.

The ailments confronting us wherein colonic irrigation is definitely indicated come under the head of general and local toxic conditions traceable to the cecum itself. The general septic dissemination may have a local manifestation in infected tonsils, arthritis in different parts of the body, arterial hypertension, and occasionally an extremely low blood pressure. "Toxic headaches," "rheumatic sore throat," "general exhaustion," and nervous symptoms, all the way from hysteria to actual insanity, are also often traceable to the liberated putrefactive bacteria from the cecum. This is where colonic irrigation finds its most effective use.

Along with the history of the case, a radiograph by barium enema should be taken to make a positive diagnosis, but if that is not feasible, a careful diagnosis "without X-ray" as outlined in the chapter on "Intes-

tinal Stasis" may be sufficiently indicative to warrant prescribing the irrigation. The author, however, feels that too much stress cannot be laid on avoiding too much dependence on the ability of colonic irrigation alone or surging wave currents alone to accomplish the much-desired, prolonged results to the degree which could be expected from a combination of the two.

The relief of distressing symptoms backed by radiographic verification in many cases has demonstrated that colonic irrigation is in itself justifiable and necessary. Another indication for colonic cleansing is the often recognized relief that it carries to near-by organs and tissue. Cystitis, leucorrhea, prostatic disturbance and gall bladder conditions are all amenable to its effect, likewise that condition which may be caused by pressure from a distended and elongated cecum or from local absorption or both; a condition so commonly spoken of as "chronic," "relapsing," "recurrent" and "dyspeptic" appendicitis. The author has often observed that the threatened (by the surgeon) necessary operation is postponed if not obviated in consequence of the relief thus obtained.

These conclusions are all the result of long and careful observation. The dangers which are threatened by careless and ill-advised application have led to the opinion that tubes of large caliber and of any considerable rigidity should be avoided, except when handled by an expert. The mechanical action alone of such equipment might easily be productive of irreparable harm in the event of an existing pathology. At the same time a smaller and more flexible tube can as easily carry the necessary liquid into the cecum, which is the one and only essential. Furthermore, as the desired result is thus accomplished with much more comfort to the patient, it is an added argument in its favor.

CHAPTER XXIX

ELECTRICITY IN GYNECOLOGY

PREVIOUS to the use of high voltage currents in the treatment of disease, the only method of producing heat within the tissues which physicians could fall back on was developed by utilizing the special polarity effect of the negative pole of the Galvanic Current. This, moreover, was necessarily local in its action because of the chemical as well as the physiological result.

Restoration of function by any method, either drugs or physical applications, is physiological only when normal functions are simulated or accentuated up to a point short of exhaustion. Heat, deep in the tissues, so essential in physical therapy, can be produced by the Galvanic Current, but is limited in its action, for when the current is carried beyond a certain strength, chemical action takes place and inhibition and destruction of tissue result.

The destructive or chemical action of this current is essential to the removal of obnoxious or surgical areas; and to be successful the operator must have a thorough knowledge of its destructive as well as constructive action. By the use of high voltage Alternating Currents, recognized as high frequency, the heat produced, while greater, is less likely to do harm because of the absence of chemical action. In that case the heat element only need be considered. Therefore, each method has its special features of value. Therapeutically, one cannot replace the other, although many physicians, misled by

unauthoritative literature on the subject, ignore the valuable physics of the Constant Current and think that diathermy will cover all the indications where galvanism is recommended and do so in a satisfactory manner.

A more thorough knowledge of the Galvanic Current and its peculiar characteristics is the only cure for this state of mind. Any one who honestly desires the truth and will give a little time to consistently studying the fundamentals of this current will readily understand how and why it differs. Those who are willing to take this time will find themselves amply repaid and day by day, in their applications to diseased conditions, can greatly enlarge the sphere of their usefulness.

In making Direct Galvanic or Sine Current applications to cavities of the body, especially in the vagina and rectum, the position of the surface electrodes has much to do with producing positive or negative results. For instance, if an internal vaginal electrode is being used for the purpose of producing a tonicity of relaxed vaginal walls, and the external electrode is placed only on the abdomen, the front wall of the vagina alone would be in the circuit. (See Figure 80.) On the other hand, if the electrode was placed on the back, the posterior wall would alone receive the benefit, whether it was for local medication or for the general stimulating effect.

Bipolar internal electrodes as shown by Figures 81 and 82 are used for local stimulation only. The former, a vaginal electrode, is designed to induce a stimulating effect where the vaginal walls have become relaxed. The latter, a rectal electrode, is used in the lower bowel either for relaxation or prolapsus. Both are used with the rapidly Alternating Sine Current only. Figure 83 is a vaginal electrode for use with the rapidly Alternating Sine or Faradic Currents only.

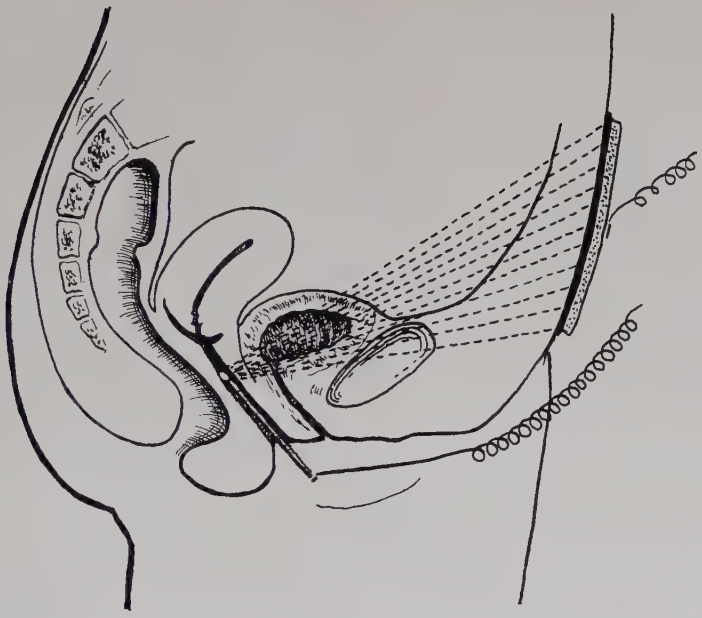

FIGURE 80

This bipolar arrangement, of course, does not always apply, as it is often the case that some particular spot alone needs the application. In that case, the external electrode must be so arranged that the point of attack by the active electrode will be in direct current circuit, as shown in the application through a small fibroid on the posterior surface of the uterine wall. (See Figure 84.) Too often when instruction is given in the use of electric currents for cavity treatments, the external electrode is placed on the "hand, leg, arm, or any convenient part," which is not productive of the best results.

While mention has been made of the technique of application in treating uterine misplacements, it may not seem clear to those unfamiliar with the definite action of the two poles of the Galvanic Current. Figure 84 represents a carbon ball electrode covered with moistened absorbent cotton placed immediately beneath a small fibroid. This electrode is attached to the positive pole. The dotted lines show the concentration of the current upon the part under treatment. Such application must be made in this definite manner in order to ensure results. In a careless placing of the electrode on the anterior cul-de-sac with the surface electrode as described, the fibroid would be but little benefited.

For simple prolapsus and relaxed vaginal walls, the electrode would be placed in the lower part of the vagina. Figure 85 represents a carbon ball electrode covered with saturated absorbent cotton or gauze, attached to the positive pole in conjunction with two surface electrodes, using a bifurcated cord attached to the negative pole. By observing the dotted lines, one can see that the current is being distributed over the part evenly; whereas, if the application were made in an indifferent manner with one electrode, as in Figure 80, only the anterior portion would be benefited, or if the surface

electrode were on the back, only the posterior portion, as indicated by the dotted lines.

If a copper-tipped vaginal electrode, or a carbon ball covered with absorbent cotton saturated with any medication as saline, zinc, copper, silver, or any iodine preparation is being used for the benefit of the whole vaginal surface, the use of double surface electrodes would be the proper technique, as shown in Figures 85 and 86.

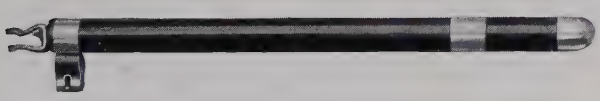

FIGURE 81
Bipolar Vaginal Electrode

FIGURE 82
Bipolar Rectal Electrode

FIGURE 83
Vaginal Electrode

If an anteversion or flexion is the condition to be met, then the internal electrode (carbon ball covered with moist absorbent cotton) would be placed at the anteversion or flexion on the anterior cul-de-sac, with the surface electrode on the back. If it was a retroversion or flexion, the internal electrode would be placed as shown by Figure 84, and the external surface electrode on the abdomen, the dotted lines showing how the current can be concentrated at the desired point.

If the uterine malpositions just mentioned require a contractile and possibly an astringent within the vagina, the positive pole should be the active one. Where there are adhesions within reach and an indurated condition

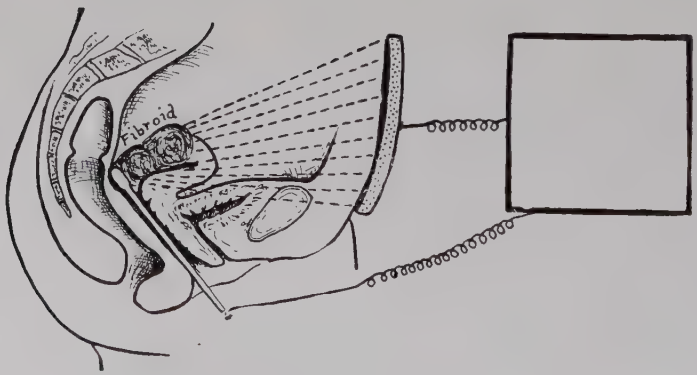

FIGURE 84

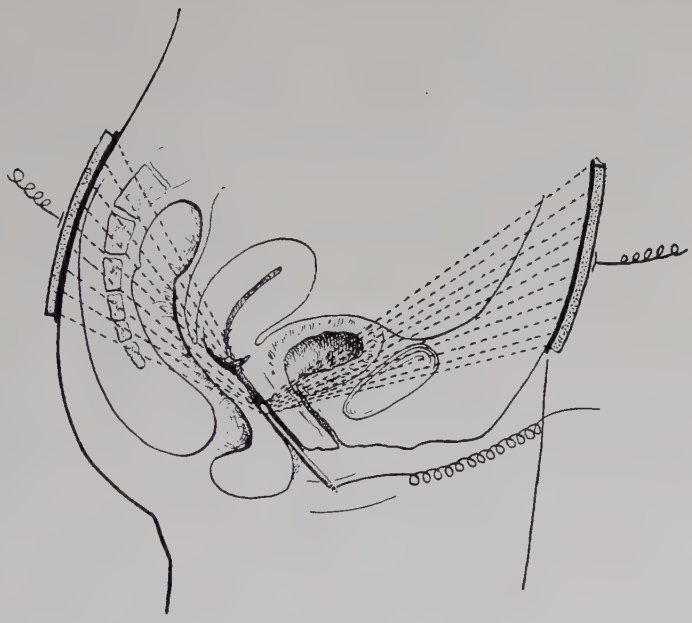

FIGURE 85

of the uterine walls, the negative should be the internal electrode so that iodine or other ionic medication can be adapted. In these cases better results will be obtained by using a current of not over twenty milliamperes for twenty minutes than to use, as is often advocated, forty to one hundred milliamperes, thus causing unnecessary and painful contractions.

Figure 87 represents a zinc or copper intrauterine electrode in position, and here again two surface electrodes should be used as already outlined, in order that all parts of the cervical canal may be equally benefited.

Figure 85 shows the position of a carbon ball electrode when placed just within the vagina in close contact with the urethra, and the surface electrode on the abdomen, for the treatment of incontinence. This technique applies to females, while with males the internal electrode should be inserted within the rectum. The proper pole for contact with the urethra would depend somewhat on whether the case is acute, subacute or chronic. The more chronic the case, the more desirable is the negative pole; also, the Unidirectional Surging Current might be applied. The Galvanic Current without the surging action is often used in these cases for chronic cystitis.

A copper-tipped electrode is often used for the treatment of bleeding hemorrhoids, or for ionic medication of ulcers within the sigmoid and other local affections. Unless one particular small area appears within range of vision by proctoscope or speculum, double surface electrodes should be placed as described for vaginal applications. (See Figure 86.) The bipolar vaginal electrode, having two treatment surfaces, as shown in Figure 81, is usually used with the Faradic or rapidly Alternating Sine Current, but never with the Galvanic, for local invigoration of relaxed vaginal walls.

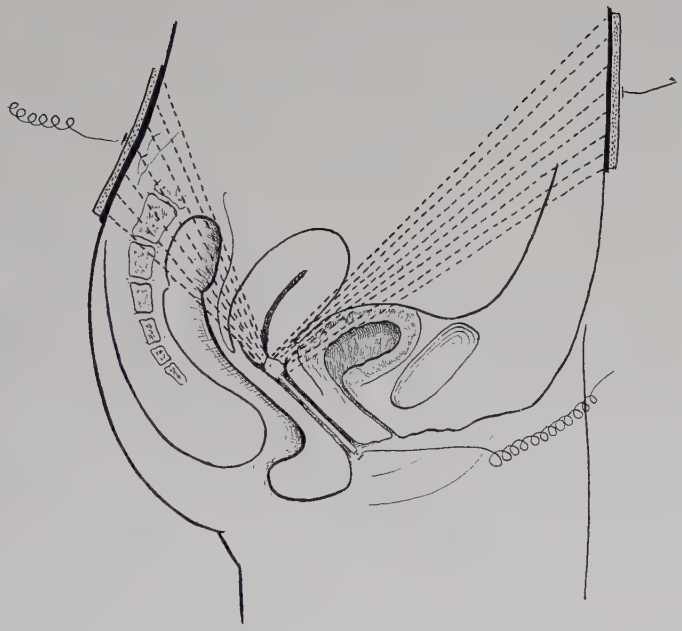

FIGURE 86

Figure 82 represents a bipolar rectal electrode having the same general construction as the vaginal electrode just described, but slightly curved for local relaxed conditions in the rectal region. This should be used only with the Faradic or rapidly Alternating Sine Current, never with the Galvanic, and then only to the point of easy toleration.

The bipolar vaginal electrode can also be used on a high-tension faradic coil, or rapidly Alternating Sine Current (without wave), for vaginismus. Relaxation can be produced in a short time by using a strength of current to toleration. (See Figure 88.)

There is so much diversity in functionally impaired and diseased conditions of the female pelvis which are amenable to the direct application of some form of electricity, that any general technique cannot be outlined. For instance, if there is a profuse secretion which might be termed "vaginal catarrh," some form of astringent or corrective should be used on a carbon ball cotton-covered electrode saturated with the proper medicament. If it is an erosion of the external os, application of zinc directly on the part may be all that is necessary to remove the ulcerated area and bring about healthy granulations.

When a nonmalignant condition exists, usually known as endocervicitis, the Galvanic Current applied from a zinc or copper-tipped internal electrode (positive) with two negative surface electrodes, using about ten milliamperes for fifteen minutes, is often productive of good results. (See Figure 86.)

Amenorrhea, the condition recognized by feeble or scanty menstruation and usually occurring in subjects debilitated from various causes, is very often relieved by the application of galvanism. A cotton-covered carbon ball electrode should be placed within the vagina so

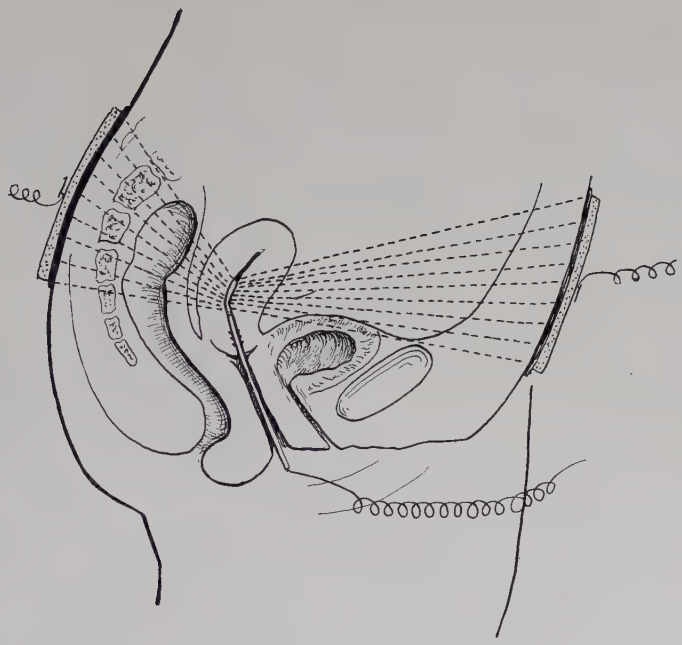

FIGURE 87

that the current will go through the entire organ. The negative pole should be attached to this, and the positive pole placed on the abdomen, using a current of ten to fifteen milliamperes. Amenorrhea, or irregular menstruation, appearing in young girls who have not become fully established, and producing various reflex conditions, is often relieved by placing a negative spinal electrode over the upper lumbar region and a positive electrode over each ovary separately. Use a smooth Galvanic Current not over ten milliamperes for ten minutes. Such applications bring the best results when used two or three times, three days between treatments, just before each menstrual period.

Where the case is not complicated, the application of the positive pole with carbon-tipped electrode covered with absorbent cotton or gauze for its tonic effect upon relaxed mucous membrane within the vagina usually shows quick results, and one of the principal improvements which patients will speak of is a relief of bladder pressure, which has been an annoying symptom.

The use of electricity in any form within the pelvis requires a greater nicety in technique than in perhaps any other part of the body. A slight variation in the position of surface electrodes when treating neuritis, arthritis, paralysis, etc., might not cause a marked difference in the result, but in gynecology special care is demanded. For instance, the negative pole, when used for adhesions, whether ionically or otherwise, must be kept in the exact place where results are looked for. If this is not done the effort is futile, and possible harm might result. This applies especially to the Galvanic Current, and whether it becomes a powerful agent for good or evil depends on the care that is exercised.

The insertion of an interuterine copper electrode for the control of hemorrhage in menorrhagia and for the

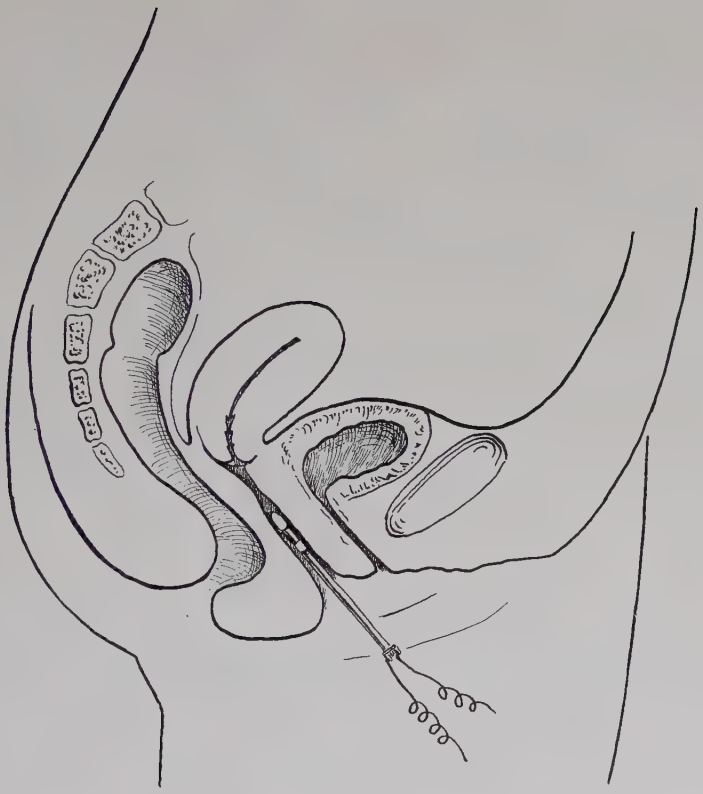

FIGURE 88

treatment of some forms of endometritis is shown by Figure 87. This shows the electrode in position connected to the positive pole. Ten milliamperes for twenty minutes repeated not oftener than once a week is good technique. Figure 95 shows the electrode which is used.

Dysmenorrhea and sterility are prominent symptoms resulting from a stenosis of the cervix, and electrolysis is the ideal method for relief. A set of graduated electrodes with insulated handles, as shown in Figure 94, should be used for the purpose. The technique consists of placing a large surface electrode on the abdomen and inserting one of the electrodes just described into the cervix. The proper size to be used can be determined by a uterine sound. This cervical electrode should be kept firmly in place by a supporter, as shown in Figure 11, and carry not over eight milliamperes from the negative pole for about fifteen minutes' duration. If very painful, less current may be used with a longer period of application. A second application should be made in ten days and if the hoped-for result has been obtained, a cervical electrode of a larger size can be used. For each successive treatment, the size of the electrode may be increased in proportion as the electrolysis has been successful. Care should always be taken to turn the current on and off very slowly to avoid unnecessary and painful contractions.

The term leucorrhea is a name given to a vaginal discharge, but it does not convey any very intelligent meaning. Consequently, until its real character has been established, no definite indications for therapeutics can be safely determined.

A thin, acrid discharge may come from an erosion of the cervix, or a whitish fluid from the vaginal wall. This is commonly spoken of as vaginal catarrh, or vaginitis.

The muco-purulent type of discharge is usually thick,

FIGURE 89

FIGURE 90
Carbon Ball Electrode

adheres to the cervix tenaciously and is removed with difficulty. Outside of gonorrheal infection, the cervix as a focal point may disseminate streptococcus infection the same as might be expected from the tonsils and cecum. Dr. Curran Pope finds that the blood, kidneys, joints, gall bladder, spleen and pericardium have exhibited bacteria traceable to the cervix and uterus as a source of infection. Therefore, the peculiar character of the discharge and its source are the factors on which medicinal action should be based. If the cervix is not especially involved, while the thin, irritating discharge as above mentioned is present, copper or zinc can be applied from the positive pole on large copper or zinc-tipped electrodes, or a two per cent solution of sulphate of zinc or sulphate of copper. Ten to twenty milliamperes of current for twenty minutes is a suitable technique. These metals are astringent and powerfully antiseptic. Two external surface electrodes should be used in order to cause a greater distribution of the effect desired. (See Figures 85 and 86.) The same technique applies when the electrode is applied within the cervix, only a milder current should be used because of the contractions caused by it. The positive pole might be intolerable to the patient.

As elsewhere stated, when metallic electrolysis is employed the current should be slowly turned off, then reversed and a small amount of current turned on for two or three minutes. By so doing, the negative pole will soften the parts about the electrode, and it can then be easily withdrawn, thus avoiding the possibility of denuding the mucous membrane. Before using the zinc or copper electrode again, it must be polished to a fresh oxidizing surface, otherwise the oxychloride of copper or zinc deposit from the previous application would act as insulation.

To properly prepare a zinc or copper internal elec-

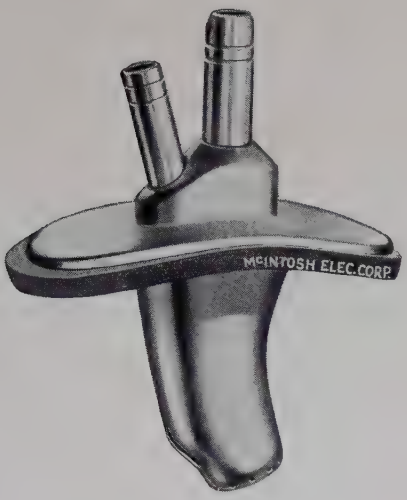

FIGURE 91
Applicator for Vaginal Irrigation

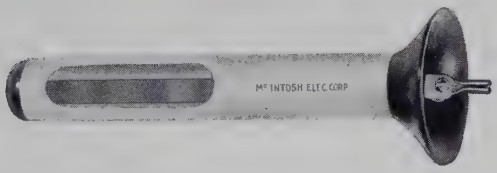

FIGURE 92
Insulated Speculum for Localizing Ionic Medication

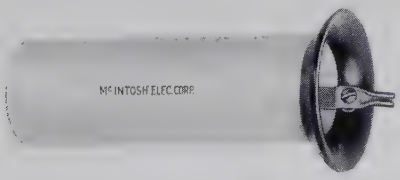

FIGURE 93
Insulated Speculum for Cervical Ionic Medication

trode, for insertion, after it has been polished (emery paper is very good for this purpose), wash it in hot water and then dip it into a ten per cent solution of hydrochloric acid, then into metallic mercury and rub for a minute with a piece of gauze or cotton. In this way one has a perfectly sterilized applicator.

If there is a hard, indurated cervix, which is producing the discharge, first apply the negative pole thereon with a cotton-covered electrode (any metal will do), saturated with a saline solution for its softening and dehydrating effect. After this result has been obtained, the positive pole and metals as just described may be applied.

If there is a condition of simple uterine prolapsus, the method described for anteversion or retroversion would apply; this to be followed by an application of the Alternating Sinusoidal or Faradic Current, using the bipolar vaginal electrode and a surface electrode on the back. Sometimes in treating prolapsus it is desirable to have a strong current for a short period, as might apply to a hemorrhagic fibroid. Two electrodes — one front and one back — with a bifurcated connecting cord, would diminish skin resistance and make the application more tolerable to the patient.

In the case of a small fibroid of the interstitial variety, whether the treatment is for the purpose of preventing prolonged menstruation or not, the current should be concentrated on the growth itself. (See Figure 84.)

Figure 89 shows how an internal electrode is held in place in the vagina by a supporter. The carbon ball and the copper ball electrodes are shown in Figures 9 and 90. The carbon ball should be covered with absorbent cotton, although fishskin or gauze is used by many as a substitute.

For anteflexion or anteversion, the proper application

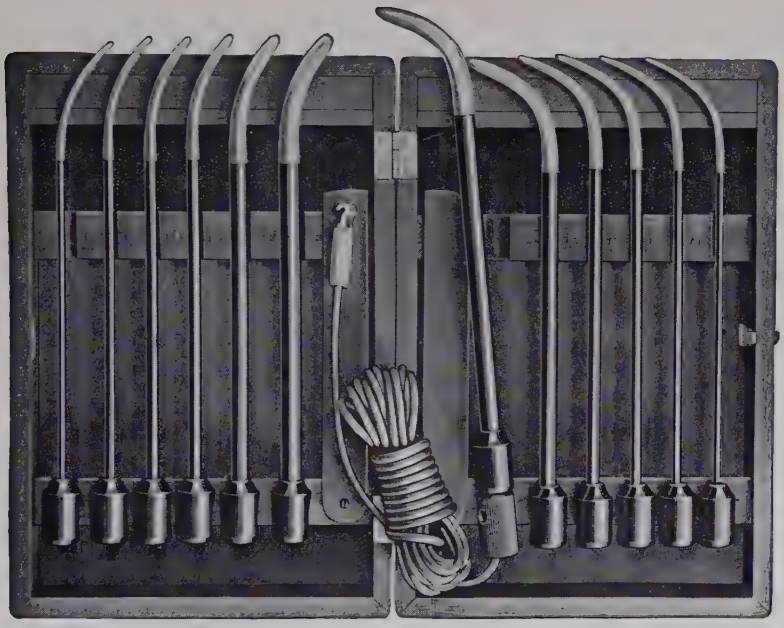

FIGURE 94
Cervical Electrodes, Graduated in Size

is to have the carbon ball vaginal electrode covered with absorbent cotton and placed on the anterior portion of an anteflexed uterus, with the indifferent electrode on the back. This concentrates the current at the curvature where the weakened portion of the uterine wall is located.

For retroflexion or retroversion, the same procedure as outlined applies, only the electrode is placed in the posterior portion of the uterus where the wall is weakened from displacement, and the surface electrode placed on the abdomen, thus concentrating the current on the weakened musculature of the uterine wall. The internal electrode in both of these cases, other things being equal, should be negative to increase the local nutrition. The current should be from ten to twenty milliamperes, using a treatment of not over twenty minutes' duration.

Figure 91 is a vaginal applicator to be used when desirable with an irrigation apparatus, not only for irrigation alone, but when certain medicated solutions are indicated. This procedure is often advisable preceding some of the galvanic applications described in this chapter.

Figures 92 and 93 are speculum-like instruments designed to be used in making applications to rectal and vaginal mucous membranes, where ionic medication is indicated.

By means of these appliances, it not only is possible to treat a larger surface, but the possibility of doing some damage to a healthy portion of the mucous surface is minimized. Incidentally, they serve to protect the edge of where the skin and mucous membrane meet, which is always very sensitive to low volt currents of electricity.

FIGURE 95
Intrauterine Electrode

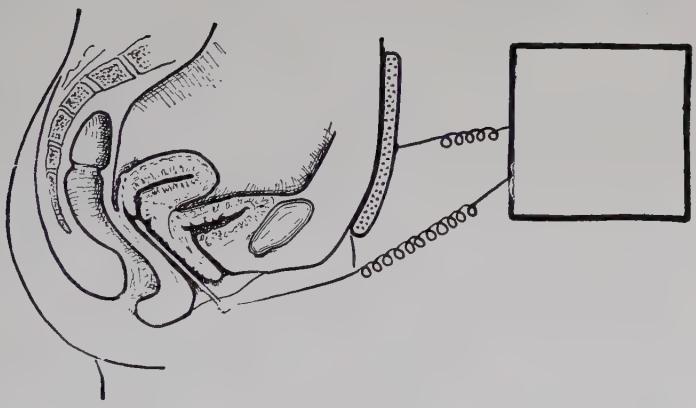

FIGURE 96

Figure 96 illustrates an application with the electrode deeper in the vagina than shown by Figure 80. This is suitable technique for prolapse or anteversion.

CHAPTER XXX

GENITO-URINARY AFFECTIONS

URETHRAL STRICTURE

SO far as general technique is concerned, the same rule applies to urethral stricture as has been outlined for cervical electrolysis. Figure 97 shows one of several graduated sizes of insulated electrodes used for this purpose. It will be observed, however, that it is more curved than the one used for the cervix. Olive-tipped electrodes as shown by Figure 98 are the most common form used, but the author has found that the gradually tapered tip often obviates a sudden shock besides having a surface sufficiently long to engage two strictures should they be reasonably near each other. Six milliamperes for about ten minutes' duration is a proper technique, with positive electrode on the back.

To be as accurate as possible, the size of the electrode should be slightly larger than that of a sound which can comfortably pass the stricture. The electrode should be lubricated with some water-soluble substance, such as K. Y. jelly, for instance, not with vaseline, which is undesirable because of its insulating ability.

It is advisable to avoid the use of vaseline or any other oily substance as a lubricant for galvanic electrodes when used on a mucous membrane, as it interferes with the passage of the current. This rule, however, does not apply to the Faradic or the rapidly Alternating Sinusoidal Current. Water-soluble lubricants can usually be procured from instrument dealers.

After what has already been said it may seem almost unnecessary to specify that the negative pole should be attached to the urethral electrode and the current turned on very slowly until the proper amount is obtained. Such however is the rule and it should be carefully observed.

As already stated, the author prefers the type of electrode having a long treating surface because the stricture can be more gradually approached and in case

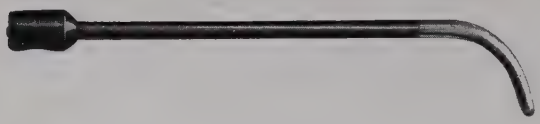

FIGURE 97
Urethral Electrode

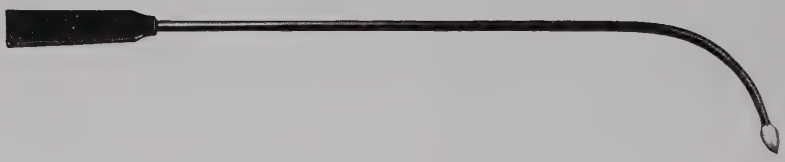

FIGURE 98
Olivé-Tipped Electrode

two strictures are near each other, one application could involve both, thus simplifying technique. The olive-tipped electrode is equally good for electrolysis so far as carrying the current to the point desired is concerned. Figure 99 is the same general style as the urethral electrode, but having a lesser curve is best adapted to the cervix. Like the urethral electrodes, this type is obtainable in all necessary sizes. Figures 100 and 101 are insulated tips of zinc and gold, respectively. The zinc tip is for ionization purposes and the gold tip is for positive pole coagulation, or for use anywhere the bare metal might be indicated, and where oxidation of soluble metals would be objectionable.

STENOSIS

Constriction or narrowing of any pore, duct, vessel or passage may be said to be stenotic.

Stenosis about the heart, a consequence of inflammation of the connective tissue of the myocardium, or a similar condition in the coronary arteries which comes under the head of stenosis of the heart, are sometimes relieved by diathermy and galvanism.

FIGURE 99
Cervical Electrode

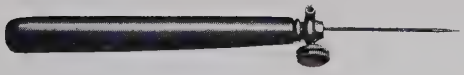

FIGURE 100
Zinc-Tipped Electrode

FIGURE 101
Gold-Tipped Electrode

The form of stenosis where negative galvanism by the electrolytic method can usually be made a positive and effective operation is a condition that follows some form of injury. This may have been the application of strong medicinal substances, such as acids, forcible dilatation or surgery, any one of which may be followed by cicatricial tissue. It is this hard, fibrous substance of varying density which must be absorbed to insure the looked-for results.

Figure 94 shows the proper electrodes for the purpose and the text descriptive of urethral stricture endeavors to outline the procedure with sufficient clarity so that reasonable care not to overdo the process will be taken. When in doubt, however, of just what happens about the hidden electrode, a piece of juicy meat may be used previously to observe the electrolytic process.

CHAPTER XXXI

SUMMARY

IF one has sufficient fundamental knowledge of the Galvanic and Sine Wave Currents to understand their physiological and chemical action, as described in the preceding chapters, he should in like measure be proficient in applying them to the many conditions which arise in daily practice and call for relief, whether they can actually be classified as diseases or otherwise. It is an accepted fact that pain is commonly due to pressure which may be located either directly about the part, or remote from it. It is likewise acknowledged that the majority of chronic ailments are due to injury or infection; and, as a matter of course, the injury or infection must be determined before the pressure point is accounted for.

The symptomatic treatment of diseases or impaired function resolves itself into certain essentials, among which one of the first in importance is the relief of pain or immobility. In galvanism, we have the greatest pain reliever outside of opiates, and without the unpleasant after-effects of the drugs. However, galvanism may be so wrongly applied that it will not only aggravate the pain but it may also cause permanent damage. Therefore, the principle, as well as the mode of procedure, should be studied and thoroughly understood.

If the pain is due to a congestive area, the positive pole is indicated at or about the point of pressure. If, on the other hand, the pain is caused from pressure, either in muscles or joints, due to an arthritic deposit, the

negative pole is indicated because of its softening effect and the relief thereby induced. Therefore, it can plainly be seen that the selection of the proper pole is all-important.

In the foregoing pages, there has been an earnest attempt to stress the importance of careful technique and words of caution have been added for the benefit of any who lack familiarity with the current action, because after all is said and done one must use judgment and above all common sense. The more time that is spent studying the "whys and wherefores" of this work, the less will be spent in apologizing for unpleasant occurrences that are likely to happen through lack of knowledge.

As the late Theodore Roosevelt once said, "The success of any undertaking depends upon the thoroughness with which the work is done." Therefore, if this book is the means of inducing physicians and their assistants to be more careful and painstaking in applying this part of physical therapy, the author will feel that his efforts have been eminently worth while.

In the chapter on "Physical Therapy," the object has been not so much an attempt to express an opinion on the subjects as to impress upon the reader that physical therapy has its place, and when used under definite indications, as are the well-known and recognized medical and surgical procedures, certain definite therapeutic results will be obtained.

In the chapter on "Galvanism," while the many physiological and chemical actions of this fundamental current have not been individually exploited, sufficient has been said to convince even a casual reader that the direct current is like a two-edged sword, cutting both ways. This is because its chemical and physical activity at the two poles is diametrically opposite and conse-

quently must be applied to diseased tissue in strict conformity to each special indication. Words of caution have been frequently added so that the operator might not go wrong because the principle, that anything that is sufficiently powerful to cause any considerable change in tissue must be used with discretion, applies to electricity the same as to any other therapeutic procedure. However, if too feeble a current is used, results may not be readily obtainable; and on the other hand, if too strong a current or too prolonged applications are indulged in it may cause an unlooked-for and unfavorable reaction. Therefore, in the use of galvanism, one must not exhibit too much temerity or undue timidity. The technique here outlined has endeavored to point out what would seem proper dosage and time of application, all other things being equal.

In the chapter on "Electromedical Nomenclature," it has been explained how writers of the older and more modern schools have used different terms to express the same thing. Therefore, the student should familiarize himself with both in order to avoid confusion.

Too frequently operators are satisfied to rely on the manufacturer of the apparatus or his representative, for their entire information regarding its therapeutic use and the proper technique to be followed. Such information may be correct so far as it goes, but as a usual thing it is not sufficiently explicit to be accepted and blindly followed. It is far better for every one using physical methods to indulge in a little independent study and so learn to view the whys and wherefores of his therapeutic applications from a purely therapeutic angle. Armed with knowledge gained in that way, one feels greater self-reliance and can proceed with assurance that his efforts will produce a well-defined and clearly understood result.

The subject of "contact" is in reality one having far greater consequence than is commonly accredited to it. To many it may seem like a minor detail, but in the last analysis, success or failure may depend on no less obscure a factor than the ability or inability of a surface electrode to properly conduct the current. The tendency to neglect the essentials of current delivery is unfortunate because they are fully as important as those of current production.

In some instances physicians, no doubt, may have abandoned the use of electricity in the treatment of their patients, because they came to be dissatisfied with results. Failures of this kind could usually be traced, not to the fact that the apparatus was out of order so much as to the fact that electrodes either had been neglected, become broken or were always inefficient.

In cavity work, especially in gynecology, the indifferent electrode must always have sufficient flexibility and conductivity to carry the required amount of current without detriment to the skin. This is also true when treating painful areas, especially those about the face and in other parts of the body where the contact surface is small. Great care must be taken to insure the electrode's being of proper construction and carrying sufficient moisture to diminish skin resistance to the minimum.

Electrodiagnosis may be dry reading as compared with therapeutic procedures and looking at pictures, but it will absolutely pay to take the time and trouble to study the subject carefully. A thorough knowledge of it will lead to more correct diagnosis and prognosis and may even help one to avoid getting into an embarrassing position when and if the case happens to come under the care of another physician, or if called into court to testify.

Goitre is mentioned only briefly, and one should be very careful not to attempt treatment where there is no reasonable probability of success. Failure to observe this precaution will be liable to injure one's reputation, to say nothing of prolonging a situation where the aid of surgery should be promptly invoked.

Affections of the eye, ear, nose and mouth have received attention only in connection with the few specified areas where galvanism has proved beneficial and by its use surgery often has been avoided.

If ionization is to be successfully used as a method of treatment, a very comprehensive knowledge of the drug which is to be forced into the tissues thereby is required. One must be thoroughly familiar with its adaptability to the character of the diseased tissue where it is to be applied, also have a correct knowledge of the proper pole to be utilized, and the time and strength of application. The latter can be gained only from experience, because the density of the tissue where ionization takes place varies so far as drug permeability is concerned. In brief, the technique often requires an extra nicety of manipulation, but one will invariably find that in the light of results obtainable the effort is fully justified.

Arthritis is a subject so broad, and the condition one that is capable of so many manifestations, involving nearly all kinds of human tissue, that specific mention can be made of only a few of the many areas where low volt currents have proved to be applicable. However, with this as a guide, one can easily follow the basic principle and apply the currents to any arthritic areas not mentioned.

Sciatica, often caused by sacroiliac sprain, and other forms of neuritis are conditions where rest, immobility and galvanism seem to be a valuable triad. The same principle would apply to the feet and ankles.

In summing up the facts surrounding the care of feet and ankles, we find that a number of conditions are plainly amenable to electrical and mechanical therapeutics, and electricity and massage have been used by foot specialists for a long time.

Formerly the Faradic Current, combined with an indifferent use of the Galvanic Current along the course of the nerve trunks, served more or less as a sedative and stimulant, nothing more. Massage has been used in four distinct varieties of manipulation, under the name of "rubbing," "kneading," "tapping" or "percussion," for inducing both passive and active movements. However, with our present knowledge of the polarity effect of galvanism, we have learned how to utilize the negative pole which has the ability of improving nutrition by increasing the blood supply.

When this is combined with other modern methods whereby selective mechanical action can be added by the use of the Sine Wave Current, it must be admitted that science has advanced not only by simplifying the needed manipulation but by making it more effective. For reasons already stated, this should be carried out by first selecting the individual muscles and nerves about the feet and ankles which are impaired, and then making definite application. The technique is practically the same in every instance and consists of placing electrodes at the upper and lower insertions of the affected muscle, then applying the particular form of current or motion which is indicated by the conditions surrounding each individual case.

In many ways it becomes a matter of judgment and success will be measured by the physician's knowledge of the physical construction of the human foot and the effect that can be induced by each of the low volt currents.

In case of paralysis, where restoration or partial restoration of normal function may reasonably be expected, gratifying results can usually be brought about by applying heat and inducing exercise. The modern low volt current apparatus, through negative galvanism, supplies the necessary localized heat, and through the use of the Sine Currents, either Unidirectional or rapidly Alternating Sinusoidal in measured waves, physiological impulses are created, which become the mechanical part. Here again judgment must be based on technical knowledge and experience, so that one's zeal to achieve some outstanding therapeutic result will not lead him to unwittingly indulge in overstimulation and thereby cause subsequent exhaustion.

Intestinal stasis is a subject which deals almost entirely with conditions of the colon, and to be more explicit, with the cecum and sigmoid. Because of the distorted shape which they frequently assume, the cecum and sigmoid become toxic areas, and of the two the cecum is doubtless the greatest offender, as in it originates the major portion of the putrefactive bacteria.

The technique suggested for the various applications of the Sine Wave Current for intestinal stasis is based wholly on the author's experience. Consequently it runs somewhat contrary to the teachings of Doctors Ireland, Eberhart, Mary Arnold Snow and others, who claim equally good results from treating the spinal reflexes. Such is doubtless the case and the author gives them full credit for their finding.

Colonic irrigation is so closely associated with the treatment of intestinal stasis that this book has gone into the subject at considerable length. Not only have its indications and contraindications been pointed out, but also a specific reason is given why a certain mode of application as regards tubes should be utilized. Also the

thought of combining Sinusoidal Current impulses through the colon with colonic irrigation has been brought to the reader's attention.

Gynecology offers such a great field for the relief of inflammation, removal of postinflammatory products and restoration of function, that a volume might be written on this subject alone. Many conditions present themselves where low volt currents are especially indicated, and where the usual topical application and surgery are disappointing. To gain the clearest idea of how broad its usefulness really is, one should familiarize himself with the polarity effect of the Galvanic Current before reading the chapter on this subject. The same may also be said of genito-urinary affections.

SUMMARY OF GALVANIC AND SINE TREATMENTS

Anesthesias, Local	Negative galvanism
Apoplexy	Positive galvanism
Artificial Respiration	Interrupted galvanism
Adenitis	Negative galvanism (iodine ionization)
Adhesions	Negative galvanism (ionization)
Amenorrhea	Negative galvanism and Sine Wave Current
Analgesia	Galvanism (rapidly Alternating Sine Current)
Angina Pectoris	Galvanism
Angioma	Galvanism (positive zinc electrolysis)
Ankylosed Joints	Negative galvanism
Aphonia	Alternating Sine Wave and galvanism
Arthritis, Acute	Positive Galvanic Current
Arthritis, Chronic	Negative galvanism and Galvanic Sine
Atrophic Rhinitis	Negative galvanism
Asthma	Galvanism and Sine Wave Current
Bursitis	Galvanism
Cerebral Hemorrhage	Positive galvanism
Cicatricial Tissue	Negative galvanism
Colle's Fracture	Galvanism and Sine Wave Current
Colitis, Mucous	Galvanism and Alternating Sine Wave Current
Conjunctivitis	Mild positive galvanism
Constipation	Alternating Sine Wave Current

Cataphoresis:	
Aconite	Positive galvanism
Chloroform	Positive galvanism
Cocaine	Positive galvanism
Iodides	Negative galvanism
Quinine	Positive galvanism
Salicylates	Negative galvanism
Magnesium	Positive galvanism
Lithium	Negative galvanism
Cavernous Angioma	Galvanism (positive zinc electrolysis)
Cervix, Stenosis of	Negative galvanism
Coccygodynia	Positive galvanism
Contractures	Negative galvanism
Depilation	Negative galvanism
Diarrhea, Chronic	Ionization
Diverticulitis	Ionization
Dysmenorrhea	Negative galvanism
Earache	Positive galvanism
Endocervicitis	Zinc ionization
Endometritis	Galvanism
Facial Neuritis	Positive galvanism
Facial Paralysis	Negative galvanism
Flat-Foot	Galvanism and Sine Wave Current
Gastralgia	Positive galvanism
Gastroenteroptosis	Alternating Sine Wave Current
Gastroptosis	Alternating Sine Wave Current
Goitre, Simple	Negative galvanism (iodine cataphoresis)
Hairs, Superfluous Facial	Negative galvanism
Headache	Positive galvanism
Hemorrhoids	Positive and negative galvanism
Herpetic Neuritis	Positive galvanism
Hyperesthesia	Positive galvanism

Hysteroepilepsy	Positive galvanism
Hypertrophied Turbinates	Positive ionization
Incontinence of Urine	Galvanism and Sine Wave Current
Intestinal Indigestion	Alternating Sine Wave Current
Infantile Paralysis	Galvanism and Sine Wave Current
Insomnia	Positive galvanism
Iritis	Positive galvanism
Intestinal Stasis	Alternating Sine Wave Current
Leucorrhea	Positive galvanism (ionization)
Lumbago	Positive galvanism
Menorrhagia	Positive galvanism
Moles	Negative galvanism
Neuritis:	
Acute	Positive galvanism (cataphoresis)
Facial	Positive galvanism
Intercostal	Positive galvanism
Sciatic	Positive galvanism
Brachial	Positive galvanism
Herpetic	Positive galvanism
Obesity	Alternating Sine Wave Current
Optic Atrophy	Negative galvanism
Otitis Media	Positive galvanism
Papillomata	Negative galvanism
Paralysis, Facial	Negative galvanism
Paralysis, Infantile	Galvanism and Sine Wave Current
Poliomyelitis	
Chronic anterior	Negative galvanism and Alternating Sine Wave Current
Port-Wine Nævus	Negative galvanism
Prostatitis	Sine Wave Current
Prolapse of the Uterus	Positive galvanism

Prostatic Hypertrophy	
Acute	Positive galvanism (ionization)
Chronic	Alternating Sine Wave Current
Retinal Hemorrhage	Negative galvanism
Rhinitis, Atrophic	Negative galvanism
Sacroiliac Sprain	Negative galvanism and Galvanic Wave Current
Stenosis	Negative galvanism
Superfluous Hair	Negative galvanism
Synovitis	Galvanism
Scar Tissue	Negative galvanism
Sciatica	Positive galvanism
Stricture of Urethra	Electrolysis
Tattoo Marks	Negative galvanism
Tissue, Cicatricial	Negative galvanism
Tic Douloureux	Cataphoresis
Torticollis	Galvanism
Tinnitus Aurium	Galvanism and Sine Wave Current
Turbinates, Hypertrophied	Positive ionization
Ulcers	Galvanism
Uterus, Prolapse of	Positive galvanism
Urethral Stricture	Electrolysis
Vaginismus	Alternating Sine Wave Current
Warts	Electrolysis
Writer's Cramp	Straight Galvanic Current

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